Review of Biologically Significant Caves and their Faunas in Florida and South Georgia

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ABSTRACT—At least 267 biologically significant caves have been identified in Florida and south Georgia. Alachua, Jackson, Marion, and Suwannee counties, Florida, contain over half of these localities. The macroscopic troglobitic faunas in these caves include 27 invertebrates and one vertebrate. The terrestrial component consists of an insect and a spider; the rest are aquatic. One branchiobdellid annelid and three entocytherid ostracod crustaceans are obligate symbionts on troglobitic crayfishes and probably should be considered troglobites. The rest of the region's reported cave fauna is composed of 23 troglophiles, 47 trogloxenes, and 37 accidentals. At least one bat (*Myotis grisescens*) is regularly dependent on Florida caves for certain parts of its life cycle, but leaves the cave environment to feed and migrate. Two other cave-dependent bats (*Myotis keeni* and *Myotis sodalis*) have been recorded only rarely from the region. Two bats routinely use Florida caves, but also roost in other habitats. The region's obligate cave species are grouped into six cave faunas: Econfina Creek, Apalachicola, Woodville, Ocala, St. Johns River, and Miami. Each fauna is restricted to a particular karst region and is characterized by precinctive taxa. The Ocala Fauna has the largest number of taxa (12) and inhabits the largest geographic area, whereas the Econfina Creek Fauna has the smallest number (2). The latter also is the only fauna in the region that does not include at least one troglobitic crayfish and amphipod. The two most complex faunas (Ocala and St. Johns River) are subdivided into smaller assemblages. Most Florida troglobitic taxa have been identified by the Florida Committee on Rare and Endangered Plants and Animals as

deserving state and/or federal protection; currently one cave crayfish is considered a Species of Special Concern by the State of Florida; and the Squirrel Chimney Cave Shrimp is listed as Threatened under provisions of the U. S. Endangered Species Act of 1973, as amended.

Since 1894, naturalists have identified Florida springs, sinkholes, and caves as habitats of plants and animals (Hubbard 1901; Lonnberg 1894, 1895; Faxon 1898; Hubbell 1936; Carr 1939; Hobbs 1940*a*, 1941, 1942*a*, 1942*b*; Young 1942, etc.). H. H. Hobbs, Jr. and H. B. Sherman apparently were the first to attempt a systematic survey of Florida's caves in order to enhance their studies of cave species (Hobbs 1942*b*; Hobbs et al. 1977). Ferguson et al. (1947) followed with the first catalogue of the springs of Florida, a work that was later updated by Rosenau et al. (1977). In 1962, the Florida Speleological Society published the first extensive inventory of caves of Florida and south Georgia (Hippenmeier et al. 1962). This list included 188 caves in Florida and south Georgia that could be entered using traditional caving methods. The pioneering survey efforts of the Florida Speleological Society also led to papers on the state's cave-associated vertebrates (Pylka 1957) and aquatic troglobites (Pylka and Warren 1958, Warren 1961). The crayfish portion of Warren's 1961 list was updated by Hobbs et al. (1977), Franz (1982), Franz and Lee (1982), Hobbs (1989), and Franz and Franz (1990). Peck (1970) provided the first comprehensive list of terrestrial arthropods from Florida, including the first records of terrestrial troglobites from the state. Franz et al. (1971) presented a list of gastropods from caves in the Marianna area of west Florida.

Since 1968, many important biological discoveries in Florida caves have led to the description of 11 new troglobitic taxa. Most of these discoveries resulted directly from efforts of the cave diving community, particularly divers associated with the Cave Diving Section of the National Speleological Society and National Association of Cave Divers. Aided by advances in SCUBA equipment, divers penetrated many previously inaccessible underwater cave systems. These discoveries have enhanced our ability to interpret better the factors that have led to the development of the region's complex aquatic troglobitic faunas.

This paper provides an updated list of the troglobitic species of Florida and south Georgia. It summarizes distributional records for both troglobitic and other cave-inhabiting species and comments on the zoogeographic patterns exhibited by troglobitic species in the region. The distributional patterns for cave crayfishes originally proposed by Franz and Lee (1982) for the most part remain intact, i.e., (1)

faunas of the Apalachicola, Woodville, Ocala, and St. Johns River karst areas are found in groundwater habitats associated with the Floridan aquifer, primarily the upper Eocene Ocala Group limestones; (2) limestones covered with deep sand and clay overburdens tend to lack troglobites; and (3) the distribution of certain troglobites are correlated with the relative levels of organic materials that collect in subterranean systems.

METHODS

We obtained information on caves and their faunas from many sources. Over the years, dozens of cavers and cave divers provided critical specimens of cave species and freely contributed information on cave locations, maps, and descriptions, which have given us a better appreciation of this region's complex cave faunas.

Precise locations of caves have been omitted from our paper given the sensitivity of caves and their faunas to human disturbance. If someone needs specific information concerning particular sites they should contact the authors, members of the Florida Speleological Society, Cave Diving Section of the National Speleological Society, National Association of Cave Divers, or the staff of the Florida Natural Areas Inventory (FNAI) (1018 Thomasville Road, Tallahassee, FL 32303).

We obtained voucher specimens from previously unsampled caves in a variety of ways. Many samples were either caught by hand or with dip nets. When possible, cave crayfishes were caught in minnow traps that were baited with canned cat food. Cans were punctured and placed inside the closed traps. This technique proved very successful, e.g., two traps left for 24 hours in the main pool at Sunday Sink (Marion County) attracted 125 crayfish (*Procambarus lucifugus*); however, this technique was not effective in catching spider cave crayfishes (*Troglocambarus*) in more than a hundred trapping attempts.

Terms—Common names for decapods follow Williams et al. (1989), except when new distributional information or taxonomic interpretations beg for the use of another name. We also propose common names for recently described taxa that were not included in Williams et al. (1989). Additional common names have been applied over the years to a number of the taxa and are listed in the *Other Common Names* section of appropriate species accounts.

We use an ecological classification for cavernicoles modified from Peck (1970), Hobbs III (1992), and Holsinger (personal communication, Old Dominion University). *Troglobites* (or stygobionts) are restricted to caves or groundwater habitats and have obvious morphological adaptations for subterranean habitats (e.g., reductions of the eye structure

and loss of pigmentation); *troglophiles* may complete their life cycles in caves, as well as in certain non-cave habitats, and do not show the extreme morphological adaptations that are usually reserved for troglobites; *trogloxenes* regularly are encountered in caves but can not complete their life cycles in them; *accidentals* are species that do not normally inhabit caves but for one reason or another had taken refuge in specific caves at the time of visitation.

We follow Frank and McCoy (1989) in their uses of the terms indigenous and precinctive, rather than native and endemic. Based on their interpretations, "indigenous" is preferred to "native" because the latter has "subsidiary meanings in English;" "precinctive" is restricted to taxa that are indigenous and "known from no other area."

HISTORY OF FLORIDA BIOSPELEOLOGY

Early Period (1893-1897)—Florida biospeleology began in 1893 with the discovery of white crayfishes in a hand-dug well at Lake Brantley, near Orlando, Seminole County. This crustacean was named *Cambarus acherontis* by its collector, the Swedish naturalist Einar Lonnberg (Lonnberg 1894, 1895).

The next discoveries occurred in 1894 while H. G. Hubbard, the noted entomologist who worked as a Special Agent of the U.S. Entomological Commission (United States Department of Agriculture), was visiting colleagues, W. T. Webber and H. J. Swingle at Eustis, Florida. According to Hubbard (1901:395-396), after receiving word of caves in Hernando and Citrus counties, they traveled the 30 or 40 miles (48-64 km) from Eustis to explore caves at "Istachatta on the Withlacoochie River" and "Double Hammock country, in Citrus County." At Double Hammock, they encountered a large "cavern, 75 to 100 feet deep, in a hillside of open pine woods." They noted "white crawfish very much like those in the Mammoth Cave," bats, streblid flies (*Trichobius major*), mites, "hairy Muscid" (fly), minute black gnats, spiders, "Hemipteron," molds, and cave fungi. They named this cave Gum Tree Cavern (later called Gum Cave or Sweet Gum Cave) because of a large sweet gum tree that grew on the verge of the sinkhole entrance. Their collection of white crayfishes from this cave currently resides in the crustacean collection at the U.S. National Museum of Natural History. Faxon (1898) examined these specimens, but failed to recognize their uniqueness. He assigned them to Lonnberg's *Cambarus acherontis*, an interpretation that was followed by Harris (1903) and Ortmann (1902, 1905). The Gum Tree Cavern specimens were eventually described as *Cambarus* (=*Procambarus*) *lucifugus lucifugus* by Horton H. Hobbs, Jr. (1940*a*). In addition, there was a single specimen of *Troglocambarus*

maclanei in the original Gum Tree Cavern collection that escaped the attention of Faxon and other workers and remained unnoticed until Martha R. Cooper rediscovered the specimen mixed with the others over 80 years later! Webber and Swingle also provided additional specimens of white crayfishes to the U.S. National Museum of Natural History, but there is some question as to their origins. The collection data stated only that they were received from Swingle and Webber from Eustis, Lake County, Florida, in November 1897. It is not known whether the specimens originated in the Eustis area or were collected elsewhere and shipped from Eustis. Hobbs (1940*a*) considered these specimens similar to his *Cambarus lucifugus* from Gum Cave but indicated that they possessed certain unique features. This led him to suggest that they probably represented an unidentified subspecies of *lucifugus*. As far as we are aware, there have been no further collections of this unique crayfish.

Hobbs Period (1935-1946)—Little happened in Florida speleology between 1897 and 1935. In 1931, Horton H. Hobbs, Jr. began his long and productive scientific career as an undergraduate student at the University of Florida (Hobbs 1986). Upon graduation in 1935, he enrolled in the master's program at Florida where he began his studies on Florida crayfishes under the direction of Dr. J. Speed Rogers. Hobbs was encouraged first to survey the crayfishes of Alachua County for his master's degree (Hobbs 1936), before launching into his definitive survey of the state's crayfish fauna for his Ph.D., which he completed in May 1940 (Hobbs 1940*b*). As part of this scholastic program, he became one of the leaders in the natural history revolution that occurred at the University of Florida during the pre-World War II years. Hobbs was the third person to earn a Ph.D in biology from this institution, following Archie Carr and H. K. Wallace.

In March 1935, Hobbs found his first cave crayfishes (*Procambarus pallidus*) in "... a small area of subterranean water exposed in the bottom of a cavelike lime sink in the southern part of Columbia County" (=Riverbed Cave) (Hobbs 1940*a*, 1986). This site was located in an abandoned stream valley at the base of the railroad embankment along U.S. Highway 27 west of High Springs. We have searched the immediate area around the railroad embankment but were not successful in relocating an exposure of subterranean water at this site; however, we have found troglobites in other sinks north of the embankment further up the valley.

Between 1936 and 1942, Hobbs collected additional material of *Procambarus lucifugus lucifugus* at Sweet Gum Cave in Citrus County,

the site of Hubbard's original collection in 1894, with the assistance of H. B. Sherman and other colleagues. Hobbs (1940*a*) also reported a second collection of this crayfish from an unidentified cave, 23.3 km (14 miles) north of Weekiwachee Springs in Hernando County, obtained by Albert Greenburg in 1937.

The first specimens of *Procambarus lucifugus alachua* were taken in Alachua County at Hog Sink in November 1937 (Hobbs 1940*a*) and at Goat Sink in January 1938. During the following November, Hobbs visited Palm Springs in Seminole County and for the first time since the original collection by Lonnberg he obtained additional material of *Procambarus acherontis* in the spring pool (Hobbs 1942*b*, 1986). Following these successes, Hobbs and Dr. Sherman used aerial photographs to locate sinkholes and other depressions, then visited the sites to determine whether they led to subterranean water. This systematic survey in the vicinity of Gainesville, Alachua County, led to the discovery of sites such as Squirrel Chimney (Hobbs et al. 1977). Between 1937-1942, students and friends, particularly William M. McLane, Lewis J. Marchand, and Alphonse C. Chable, accompanied Hobbs during his explorations. Other companions included J. Adams, W. Beck, L. Berner, A. Carr, T. Carr, J. C. Dickinson, C. S. Goodnight, M. L. Goodnight, B. J. Kaston, J. Kilby, J. M. Martin, C. Mohr, G. Pournelle, H. B. Sherman, K. Spurr, H. K. Wallace, and F. N. Young. McLane discovered the first specimens of the Northern Spider Cave Crayfish at Squirrel Chimney in March 1941, which Hobbs named *Troglocambarus maclanei* in McLane's honor (see Hobbs et al. 1977 for a discussion of this discovery).

In 1939, Archie Carr obtained the original specimen of the cave salamander, *Haideotriton wallacei*. This specimen was retrieved by Mr. Hummel, sanitary engineer with Dougherty County (Georgia), from a "200-foot well" in Albany, Georgia, after it was air-lifted to the surface (Carr 1939).The animal was named in honor of H. K. Wallace, the spider expert, Carr's colleague and friend at Florida, and Hobbs' brother-in-law. The holotype was sent alive through the mail in a Mason jar to H. K. Wallace who brought it to the attention of Archie Carr (H. K. Wallace, personal communication, [retired] University of Florida). Wallace had met Mr. Hummel when he and A. P. Black were consulting with city engineers in Albany, Georgia, in early May 1939 (H. K. Wallace, personal communication).

World War II interrupted the flow of natural history research at Florida, although several students returned after the war to finish their studies. Hobbs continued to teach at Florida until 1946 when he moved to the Biology Department at the University of Virginia. He served as the Director of the Mountain Lake Research Station between

1956-1960, and then moved on to the Department of Zoology at the U.S. National Museum of Natural History in 1962. Although retired from the Smithsonian since 1984, he retains his emeritus status there and continues to pursue his studies on the systematics of crayfishes, ostracods, and other crustaceans. Between 1940-1942, Hobbs described *Cambarus* (=*Procambarus*) *lucifugus lucifugus*, *Cambarus* (=*Procambarus*) *lucifugus alachua*, *Cambarus* (=*Procambarus*) *pallidus*, *Troglocambarus maclanei*, and *Cambarus cryptodytes* (Hobbs 1940*a*, 1941, 1942*a*). His collections of other cave organisms from Alachua County caves led to the descriptions of the isopod *Asellus* (=*Caecidotea*) *hobbsi* (Maloney 1939) and the amphipod *Crangonyx hobbsi* (Shoemaker 1941). Hobbs' early crayfish studies culminated with the publication of his treatise *Crayfishes of Florida* (Hobbs 1942*b*). This book continues to be the single most important reference on the state's crayfish fauna.

Post-Hobbs Period and the Florida Speleological Society (FSS) (1946-1969)—Little activity occurred in Florida biospeleology immediately following Hobbs' departure from the state. In 1954, Pirkle and Babb obtained a specimen of *Procambarus pallidus* from a well at Four O'Clock Church (Fort Clark) in Alachua County. Between 1952-1954, Robert B. Cumming, while an undergraduate student at the University of Florida, collected troglobitic crustaceans. His Florida cave collections included *Troglocambarus maclanei* from Squirrel Chimney and Sweet Gum caves in 1953 and 1954, respectively; *Procambarus lucifugus* and *Procambarus pallidus* from Eichelberger Cave in 1952; and the first specimen (a female) of *Palaemonetes cummingi* from Squirrel Chimney in Alachua County in 1953 (Chace 1954). The presence of *Procambarus pallidus* in Eichelberger Cave later was questioned by Franz and Lee (1982) because this locality is 40 km from the next closest documented site, and no other specimens of this crayfish have been collected from caves in the vicinity of Eichelberger Cave before or since Cumming's specimens were obtained. Eichelberger Cave has been destroyed by quarrying activities. Franz and Lee (1982) suggested that the collection had been mixed accidentally, and the *Procambarus pallidus* specimens actually were collected elsewhere. Search should be continued for the species in Marion County.

A second inventory of Florida and south Georgia caves began in 1949 with the establishment of a caving club in Gainesville. The survey was expanded to include biological and paleontological surveys when the club became a University of Florida student grotto of the National Speleological Society in 1952.

In 1956, Peter Drummond, an early member of the Florida Speleological Society, collected the first specimens of *Cambarus cryptodytes* from Climax Cave, Decatur County, Georgia, and Horst R. H. Heineman obtained specimens of what Hobbs initially identified as *Procambarus pallidus* (=*Procambarus orcinus*) at Clay Sink (probably Gopher Sink) in Leon County, Florida. Richard D. Warren was active with the Florida Speleological Society between 1956-1965. He contributed specimens of *Procambarus lucifugus* X *alachua* from Roosevelt Cave in 1960; *Procambarus erythrops* from Hildreth Cave in 1962; and *Troglocambarus maclanei* from Indian Cave in 1962. He also collected specimens of *Cambarus cryptodytes* in 1961 and 1963 at Climax Cave, the type series of *Asellus* (=*Remasellus*) *parvus* from Ten Inch Cave in 1962, and with Bousfield the type series of *Crangonyx grandimanus* from Indian Cave (Marion County) in 1962. Gerard M. Miller and Warren were the first to discover *Haideotriton wallacei* in Florida. They initially recovered specimens from Gerard's Cave in Jackson County in 1957 (Pylka and Warren 1958), and later found this salamander in Judge Cave and Washed-out Cave in Florida and at Climax Cave in Georgia (Warren 1961). Additional specimens from Climax Cave were secured by Alberta Etters (Smith) and Vernal Harkness in 1960. A brief list of cave-associated vertebrates (without specific localities) was provided by Pylka (1957). At the same time, Dale W. Rice and William L. Jennings were investigating the distribution and ecology of cave bats, particularly in the Marianna area (Jennings and Layne 1957; Jennings 1958; Rice 1955*a*, 1955*b*, 1957).

Biospeleologists John E. and Martha R. Cooper visited Richard D. Warren in 1964-1965. The Coopers obtained specimens of *Procambarus acherontis* in 1964 and 1965 at Palm Springs. The initial specimens were netted from aquatic vegetation in the spring pool; a second series was acquired from the pool by the property manager of the spring property and given to the Coopers when they returned to Palm Springs in 1965 (Cooper 1965*a*). With Warren, they also visited Goat Sink, Protheroe Sink, and Still Sink where they obtained samples of troglobitic crayfishes (Cooper 1965*b*).

Frank Hurt retrieved the first record of *Cambarus cryptodytes* from the cave at Waddell's Mill Pond in 1965. S. B. Peck made a collection of *Procambarus pallidus* at Warren Cave in 1965. This appears to be the first collection of the species from Warren Cave since Hobbs' original specimens. Notes associated with the collection indicated that the cave had been dry for 4 years prior to his finding them. Peck also obtained specimens of *Cambarus cryptodytes* at Climax Cave (Hobbs 1981) and two new staphylinid beetles at Miller's Cave

(Klimaszewski and Peck 1986). Peck's inventory of Florida caves included three collembolans, three orthopterans, six beetles, two opilionids, five spiders, one millipede, and one centipede (Peck 1970).

David S. Lee, then a student at Florida Southern College, started to visit caves in Alachua, Citrus, and Jackson counties, Florida, in 1965 (D. S. Lee, personal communication, North Carolina State Museum of Natural Science). Between 1965 and 1970, he discovered many new biologically significant sites, particularly in northwest Florida, and made several important collections, one of which was the first and only ovigerous female *Palaemonetes cummingi* from Squirrel Chimney. He conveyed this specimen alive to Sheldon Dobkin at Florida Atlantic University who successfully reared the developing larvae and published the first description of the larval development for this species (Dobkin 1971). Merlin Tuttle also visited caves in Jackson County during this same period in pursuit of gray bats (*Myotis grisescens*). Lee and Tuttle combined their expertise and encouraged the Florida Park Service to gate Old Indian Cave at Florida Caverns State Park to protect its important bat colony (Lee and Tuttle 1970), and Lee later encouraged them to limit access to other biologically sensitive caves in the Park. Lee introduced Richard Franz to Florida biospeleology in 1967. On one of the trips to Florida from Maryland, Lee and Franz visited Squirrel Chimney in hopes of obtaining additional specimens of the Squirrel Chimney Cave Shrimp, but instead, rescued a large eastern diamondback rattlesnake (*Crotalus adamanteus*) from the bottom of the vertical entry shaft (Franz 1968). Lee and Franz continued to travel to west Florida between 1968 and 1970 to explore caves in Jackson and Washington counties. Data from this period provided the basis for studies on the predatory snail *Euglandina rosea* (Franz et al. 1971) and on the cave salamander, *Haideotriton wallacei*, and other vertebrates in Jackson County caves (Lee 1969*a*, 1969*b*, 1969*c*, 1969*d*, 1976). In 1970, they collected the first specimens of *Cambarus cryptodytes* and *Haideotriton wallacei* from Pool Cave in Florida Caverns State Park. The next year, Franz took Archie Carr to this cave and showed him his first live *Haideotriton* since he had described the salamander in 1939. In 1972, Franz joined the faculty of the Florida State Museum (recent name change to Florida Museum of Natural History) at the University of Florida where he currently continues his cave studies.

Modern Period (1970-1992)—The discovery of a new troglobitic crayfish in a Miami well in 1968 rekindled interest in the state's cave crayfish fauna. This species, eventually described as *Procambarus milleri* (Hobbs 1971), was the first new cave crayfish found in Florida

since 1942 and the first new troglobite since the descriptions of *Crangonyx grandimanus* (Bousfield 1963) and *Asellus parvus* (Steeves 1964). The discovery of the Miami Cave Crayfish set the stage for the disclosure of four other crayfish discoveries in the 1970s.

D. Bruce Means, who began visiting northwest Florida caves in the mid-1960s, made numerous important collections of cave crayfishes and vertebrates from caves and sinks in the Tallahassee and Marianna areas. Means made several collections of a new crayfish at Gopher Sink and Culley's Cave in 1970 and 1971, which he and Hobbs later named *Procambarus orcinus* (Hobbs and Means 1972). Other collectors who contributed specimens used in the type description of this crayfish included H. R. H. Heineman (Clay Sink, 1956), J. Halusky (Gopher Sink, 1970), J. Bishop (Osgood Sink, 1968), J. Couch (cave 3 miles (4.8 km) south of Woodville, 1962), and L. B. Trott (Wakulla Springs, 1957). Specimens of a second new crayfish, collected first by Michael N. Horst at Big Blue Spring on the Wacissa River in Jefferson County in 1970, were described as *Procambarus horsti* in the same paper with *Procambarus orcinus* (Hobbs and Means 1972).

Barry Mansell and Frank Hurt collected the first specimens of a new cave crayfish at Sim's Sink (*Procambarus erythrops* Relyea and Sutton, 1975) in Suwannee County in 1971 (B. Mansell, personal communication, Jacksonville, Florida); they also took specimens of *Troglocambarus maclanei* from Sim's Sink, *Procambarus lucifugus* from Bat Cave (Alachua County), Sweet Gum Cave, and Indian Cave (Marion County), and *Procambarus pallidus* from Squirrel Chimney in 1971-1972. Mansell and Bruce Sutton collected specimens of *Haideotriton wallacei* from Gerard's cave in 1969. Kenneth Relyea and Sutton's explorations of north Florida caves were contemporary with those of Means, Mansell, and Hurt. They collected additional material of *Procambarus erythrops* from Sim's Sink in 1971-1972; *Procambarus pallidus* from Pallidus Sink, Squirrel Chimney, and Martin Cave in 1972; and *Troglocambarus maclanei* from Sim's Sink in 1975. The new material, plus those collected by Mansell and Hurt, from Sim's Sink allowed Relyea and Sutton to describe *Procambarus erythrops* (Relyea and Sutton 1975). Relyea also obtained two specimens of a unique crayfish from Alexander Springs in Lake County in 1973 and 1974 (Relyea et al. 1976) that later was described as *Procambarus delicatus* following the collection of a third specimen in 1985 by J. B. Smith and D. Haren II (Hobbs and Franz 1986).

In 1973, Stephen R. Humphrey and Franz visited Orange Lake Cave in Marion County for the first time after cavers reported large numbers of bats present in the cave. Lee and Franz returned to this

site in 1974-1975 and collected several series of crayfishes. They were later described as *Procambarus franzi* (Hobbs and Lee 1976). Subsequent collections at Hell Hole and Trade Wind Farm's Sink extended the known range of this species several kilometers south toward the Reddick area. Chert Cave and Sunday Sink, south of Ocala, were found to have large populations of *Procambarus lucifugus* intergrades and *Troglocambarus maclanei*. The latter was located as a result of surveys associated with the Cross-Florida Barge Canal study. Ray Ashton and Pat Sawyer Ashton collected the first specimens of *Procambarus lucifugus* intergrades from Ocala Caverns in 1976.

The momentum established in the 1970s continued into the 1980s and 1990s. Additional discoveries led to the descriptions of *Procambarus leitheuseri* in Hernando and Pasco counties (Franz and Hobbs 1983), *Procambarus delicatus* in Lake County (Hobbs and Franz 1986), *Procambarus morrisi* in Putnam County (Hobbs and Franz 1990), *Procambarus attiguus* in Marion County (Hobbs and Franz 1992), and *Dasyscias franzi* in Washington County (Thompson and Hershler 1991). During this period, there were also collections of several crustaceans that still remain unstudied (e.g., two *Caecidotea* from Orange and Washington counties and a *Troglocambarus* from Orange County). Recent collections of Steeves' *Asellus parvus* at Split Sink and Peacock Springs allowed Bowman and Sket to recognize the uniqueness of this isopod for which they erected the new genus *Remasellus* (Bowman and Sket 1985).

Throughout this period, cavers and divers continued to provide many other important specimens that added tremendously to our knowledge of the distributions of *Crangonyx grandimanus*, *C. hobbsi*, *Procambarus acherontis*, *P. horsti*, *P. lucifugus*, *P. orcinus*, *P. pallidus*, and *Troglocambarus maclanei*. Most recently, Buford Pruitt has taken many important voucher specimens of *Procambarus lucifugus*, *P. pallidus* and *Troglocambarus maclanei* in underwater caves of Levy and Hamilton counties. Pruitt also generously purchased and donated Sim's Sink to The Nature Conservancy as a cave crayfish preserve in 1987.

BIOLOGICALLY IMPORTANT CAVES

We recorded a total of 267 caves in Florida and south Georgia where biological materials have been recovered (Appendix 1). More than half are concentrated in Alachua (47 caves), Jackson (34 caves), Marion (27 caves), and Suwannee (43 caves) counties (Fig.1). Other biologically significant caves are found in Columbia (15), Levy (11), Lafayette (11), Leon (11), Hamilton (11), Gilchrist (9), Wakulla (8), Citrus (7), Hernando (6), Madison (5), Orange (4), Pasco (4), Seminole

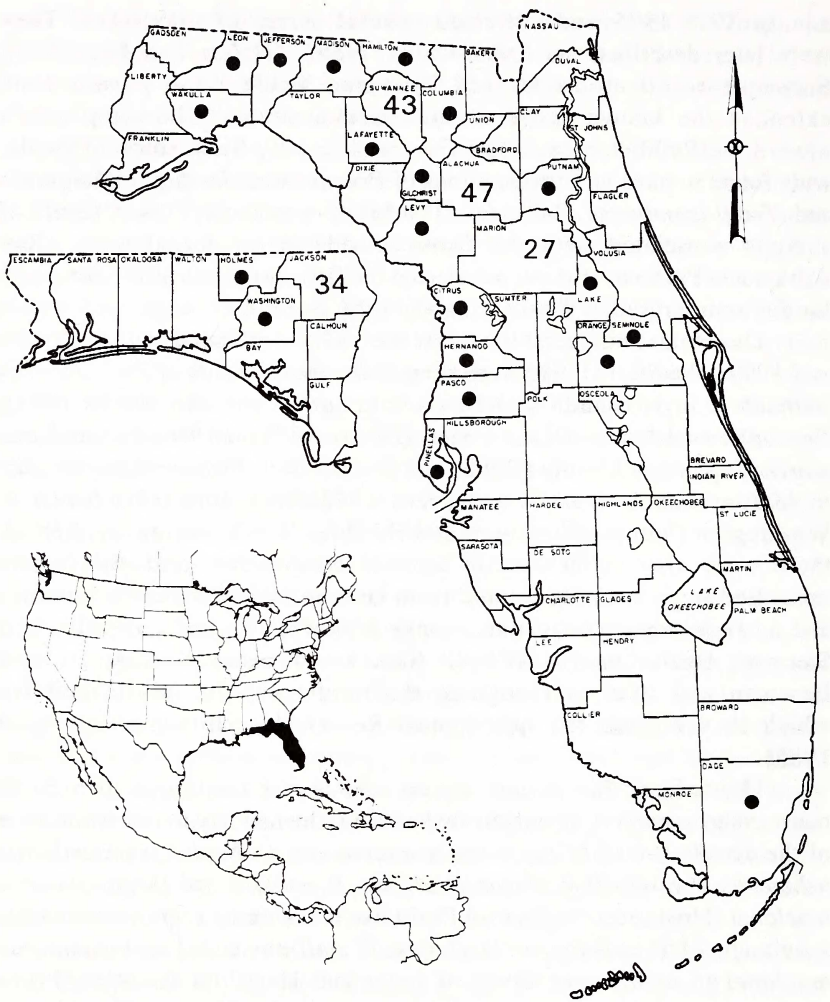

Fig. 1. Map of Florida showing county locations. Numbers of caves are shown for Alachua, Jackson, Marion, and Suwannee counties. Dots indicated other important cavernous counties.

(3), Lake (2), Washington (2), Dade (2), Holmes (1), Jefferson (1), Pinellas (1), and Putnam (1) counties, Florida, and Decatur (1) and Doughtery (1) counties, Georgia. Caves theoretically could exist anywhere in Florida and south Georgia since most of this region is underlain with extensive beds of Oligocene and Eocene limestones. These limestones are components of the Floridan aquifer, while limestones in Dade County are part of the Biscayne aquifer.

There are no reports of troglobites being recovered from especially deep wells such as those reported in the San Antonio Pool of the Edwards aquifer, Texas (blind catfishes, genera *Satan* and *Trogloglanis*, at groundwater depths between 305-582 m) (Cooper and Longley 1979*a*, 1979*b*). The deepest record of a Florida troglobite is for *Procambarus orcinus* (and possibly *Procambarus horsti*) at Wakulla Springs at about 100-m water depth. Other depth records include 67.6 m (231 ft) for *Procambarus leitheuseri* at Eagle's Nest Sink (Hernando County); 9 m (28.8 ft) for *Procambarus milleri* at the well northeast of Homestead; 44 m (150 ft) and 36.7 m (125 ft) for *Procambarus pallidus* at Fort Clark Church well and Hornsby Sink, respectively (Alachua County); 67.6 m (231 ft) for *Troglocambarus maclanei* at Eagle's Nest Sink (Hernando County); 26.4 m (80 ft) for *Cambarus cryptodytes* at Hole-in-Wall (Jackson County); and 60.8 m (200 feet) for *Haideotriton wallacei* at the Albany, Georgia, well.

Franz and Lee (1982) reasoned that limestones covered with thick layers of unconsolidated marine or aeolian sediments lack sufficient food imput to sponsor colonizing organisms. However, recent discoveries of certain colonial bacteria in a few underwater caves might provide limited grazing for troglobitic crustaceans (Hobbs and Franz 1992).

The most cavernous parts within the study region are the mature karst areas in western Alachua and Marion counties, eastern Citrus, and northcentral Jackson County, Florida. The current list maintained by the Florida Speleological Society for this four-county area includes 430 of 630 caves reported from Florida (Al Krause, personal communication, Florida Speleological Society). Caves in mature karst areas tend to have portions of their passages above the local water table. As a result many of the larger caves are inhabited by cave-dependent bats which supply large quantities of guano to fuel the biotic system. Above-water caves in the Citrus, Marion, and Jackson counties tend to be shallow and have meandering passages and multiple entrances, whereas many in Alachua County are deeper and have vertical shafts as entrances that require technical climbing equipment to negotiate. Some of the Alachua entrance holes are over 17.6 m (50 ft) deep. Speleothem development is rare in most Florida caves, although some caves in Citrus, Marion, and Jackson counties have interesting displays.

Saturated riverine karsts are developed along portions of the Choctawhatchee, (western) Econfina, Chipola, Flint (Georgia), St. Marks-Wakulla, Wacissa, Suwannee, and St. Johns rivers and their tributaries. Caves within these karsts have little or no dry passage. Access to them is usually through spring outlets, spring-siphons, or water-filled sinkholes.

Rosenau et al. (1977) listed over 300 springs in 42 Florida counties, most of which have their water sources in the Floridan aquifer, particularly the Ocala Group of Eocene limestones. Twenty-seven of these springs have recorded water flows that average six billion gal/day each and are considered first magnitude springs (Rosenau et al. 1977). Counties with saturated riverine karsts where biological specimens have been retrieved include Columbia, Dade, Gilchrist, Hamilton, Hernando, Jefferson, Lafayette, Lake, Leon, Levy, Madison, Orange, Pasco, Pinellas, Seminole, Suwannee, Wakulla, and Washington. Extensive underwater cave systems found in these counties form important conduits for local groundwater circulation. Knab (1991) noted that six of the ten longest known underwater caves in the world are located in the saturated karsts of the Suwannee and Wakulla drainage basins in Florida—Falmouth Spring (or Cathedral Sink), 3,291.8 m (10,828.3 ft); Chip's Hole, 3,169.9 m (10,427.3 ft); Sullivan's Sink-Cherry Sink, 2,590.8 m (8,522.4 ft) (Leon County, Wakulla River); Manatee Springs, 2,342.4 m (7,705.3 ft) (Levy County, Suwannee River); Luraville-Telford Spring, 2,194.5 m (7,218.7 ft) (Suwannee County, Suwannee River); Hornsby Sink, 2,055.3 m (6,760.8 ft) (Alachua County, Suwannee River). Recent explorations of the Leon Sinks complex under Leon and Wakulla counties have revealed over 14,288 m (47,000 ft) of continuous mapped passage (Gary Knecht, personal communication, Tallahassee, Florida).

SPECIES ACCOUNTS FOR FLORIDA AND SOUTH GEORGIA TROGLOBITES

Phylum MOLLUSCA

Class GASTROPODA

Order PROSOBRANCHIA

Family Hydrobiidae

Dasyscias franzi Thompson and Hershler

SHAGGY GHOSTSNAIL

Dasyscias franzi Thompson and Hershler, 1991. Malacological Review 24:57-61. TYPE LOCALITY: Blue Spring Cave System, Econfina River, Washington County, Florida. Holotype (UF 93964), 27 paratypes (UF).

DISTRIBUTION: ECONFINA CREEK FAUNA. Known only from the type locality.

ETYMOLOGY: Named for Richard Franz, discover of the snail.

REFERENCES: Thompson and Hershler 1991 (original description, SEM photograph).

Phylum ARTHROPODA
Class MALACOSTRACA
Order ISOPODA
Family Asellidae
Caecidotea hobbsi (Maloney)
HOBBS' CAVE ISOPOD

Asellus hobbsi Maloney, 1939. Proceedings of U.S. National Museum 68(3057):457. TYPE LOCALITY: Dudley Cave, Alachua County, Florida. Holotype (USNM 76434), Horton H. Hobbs, Jr. (coll.), 31 October 1937. Paratypes from Dudley Cave and from crayfish burrows at Blountstown, Calhoun County, Florida.

Caecidotea hobbsi.—Bowman, 1975:339-340.

DISTRIBUTION: APALACHICOLA (Marianna Lowlands) and OCALA FAUNAS (Upper Suwannee, Marion); also northcentral Georgia. Known from groundwater habitats in Alachua, Calhoun, Jackson and Marion counties, Florida, and in DeKalb County, Georgia. This species is not restricted to limestone areas and may be more widely-distributed than records indicate. It probably lives in interstices saturated with groundwater in unconsolidated sediments, as well as in cave pools, similar to other members of the Hobbsi group (Lewis 1982, Lewis and Holsinger 1985). The isopod was listed as a Species of Special Concern by the Florida Committee on Rare and Endangered Plants and Animals because of its restriction to groundwater habitats and its apparent rarity (Franz 1982).

SPECIFIC LOCALITIES: FLORIDA, *Alachua County*: Aulsbrook Cave (RF), Bat Cave (USNM), cave 21.7 km (13 mi) west of Gainesville (probably Dudleys Cave) (USNM), Dudley Cave-type locality (USNM, Maloney 1939, Hobbs 1942*b*), well near Micanopy (USNM). *Calhoun County*: 3.6 km (2 mi) south of Altha, near Blountstown (burrow of the Apalachicola Burrowing Crayfish, *Procambarus rogersi*) (USNM). *Jackson County*: Gerard's Cave (USNM). *Marion County*: Hollowed Ground Cave? (J. Lewis), Rainbow Acre's Cave (USNM), Roosevelt Cave (USNM). GEORGIA, *DeKalb County*: spring on Walter Chandler Estate at Emory University (USNM).

ETYMOLOGY: Named in honor of Horton H. Hobbs, Jr., the collector of the type series.

REMARKS: The Georgia record constitutes a major range extension for this species. Their identification was confirmed by T. E. Bowman (personal communication, U.S. National Museum of Natural History).

REFERENCES: Franz 1982 (conservation status), Harris 1968 (as prey); Hobbs 1942*b* (records); Lee 1969*a* (as prey); Maloney 1939

(type description), Steeves 1964 (records), 1966 (taxonomy), Warren 1961 (records, photograph).

Caecidotea sp. 1

REMARKS: Specimens of asellid isopods were collected on floating wood in the cave stream of the Econfina Blue Spring Cave System in Washington County, Florida (ECONFINA CREEK FAUNA). According to J. Lewis (personal communication, Louisville, Kentucky), this species is closely related to *Caecidotea alabamensis* and *C. nickajackensis*, which are found at cave sites in northern Alabama, and in all probability it represents an undescribed taxon. Additional collecting is necessary in order to resolve this isopod's taxonomic assignment (J. Lewis, personal communication).

Caecidotea sp. 2

REMARKS: An undescribed asellid isopod was collected by Roger Werner in Rock Springs Cave, Orange County, Florida (USNM) (ST. JOHNS RIVER FAUNA, Wekiva). Its relationships with other *Caecidotea* are unstudied (T. E. Bowman, personal communication).

Remasellus parvus (Steeves)

SWIMMING FLORIDA CAVE ISOPOD

Asellus parvus Steeves, 1964. American Midland Naturalist 71(2):450-451. TYPE LOCALITY: Ten Inch Cave, 8.4 km (5 mi) of Newberry, Alachua County, Florida. Holotype and allotype (USNM 111142), a paratypic female (USNM 111140) and paratypic male (USNM 111141), R. D. Warren (coll.), 9 June 1961.

Remasellus parvus.—Bowman and Sket, 1985:554.

DISTRIBUTION: WOODVILLE and OCALA (Upper Suwannee) FAUNAS. Known from groundwater habitats in karst areas of the Wakulla and upper Suwannee rivers. It may be more common than collections indicate.

SPECIFIC LOCALITIES: *Alachua County*: Ten Inch Cave-type locality (USNM). *Madison County*: Thunderhole Sink (USNM). *Suwannee County*: Peacock Springs Cave System (USNM). *Wakulla County*: Split Sink (USNM).

ETYMOLOGY: *Remasellus* from remus=oar (Latin) + Asellus, referring to the shape and function of pereopod 2-7 (Bowman and Sket 1985); *parvus* refers to small; so named because of its relatively small size (Steeves 1964).

REMARKS: Unlike *Caecidotea hobbsi*, this isopod may be restricted to cave habitats in light of its unusual morphology and swimming mode of locomotion.

REFERENCES: Bowman and Sket 1985 (definition of *Remasellus*, records); Steeves 1964 (original description).

Order AMPHIPODA

Family Crangonyctidae

Crangonyx grandimanus Bousfield

FLORIDA CAVE AMPHIPOD

Crangonyx grandimanus Bousfield, 1963. National Museum of Canada, Natural History Paper No. 18:1-9. TYPE LOCALITY: Indian Cave, 11.7 km (7 mi) southwest of Ocala, Marion County, Florida. Holotype (NMC 5002), R. D. Warren (coll.), 18 February 1961. Paratype (NMC 5003) from Huggin's Cave, Alachua County, R. D. Warren (coll.), December 1961.

DISTRIBUTION: WOODVILLE, OCALA (Upper Suwannee, Lower Suwannee, Marion, Gulf Coastal Lowlands) and MIAMI FAUNAS. This amphipod was listed as a Species of Special Concern by the Florida Committee on Rare and Endangered Plants and Animals (Franz 1982) because of its subterranean habits and limited distribution, and as a candidate for federal protection (Wood 1992). It appears to be widespread in groundwater habitats associated with limestone areas on the western slope of the old Northern Highlands in the Florida peninsula. This amphipod is known from the Woodville Karst in the St. Marks-Wakulla River basin, northern peninsula karsts from the Suwannee River south to Pasco County and from the Miami karst; however, it is rare at most sites. This amphipod has not been collected on the eastern slope in the St. Johns River valley.

SPECIFIC LOCALITIES: *Alachua County*: Dudley Cave (JRH), Goat Sink (JRH), Hertzog Cave (JRH), High Springs Cave (JRH), Huggins Cave (JRH), well (Archie Carr Farm) near Micanopy (JRH). *Citrus County*: Sweet Gum Cave (JRH). *Dade County*: well, Little Bird Nursery and Garden Store, Miami (JRH). *Gilchrist County*: Devil's Eye and Ear Springs (JRH). *Hernando County*: Eagle's Nest Sink (JRH). *Leon County*: Little Dismal Sink (JRH). *Levy County*: Archer Cave (JRH), well at Chiefland (JRH). *Madison County*: Madison Blue Spring (JRH). *Marion County*: Indian Cave-type locality (Bousfield 1963), well 3.6 km (2 mi) northeast of Anthony (JRH). *Pasco County*: Nexus Sink (JRH). *Suwannee County*: Cisteen Sink (JRH), Orange Grove Sink (JRH), Peacock Springs Cave System (JRH). *Wakulla County*:

Emerald Sink (JRH), McBride Slough (JRH), River Sinks (JRH), Sally Ward Spring (JRH), Shepard Blue Spring (JRH).

ETYMOLOGY: Although Bousfield (1963) did not indicate the origin of the name "grandimanus" in the original description, we presume that he was making reference to the "very large gnathopods" that characterize this species.

REMARKS: Holsinger (1972) listed this amphipod as a member of the *obliquus-richmondensis* group.

REFERENCES: Bousfield 1963 (type description); Franz 1982 (conservation status); Holsinger 1972 (records, key), 1977 (taxonomy).

Crangonyx hobbsi Shoemaker
HOBBS' CAVE AMPHIPOD

Crangonyx hobbsi Shoemaker, 1941. Charleston Museum Leaflet 16:457. TYPE LOCALITY: Huggins Cave, Alachua County, Florida. Holotypic male (USNM 79362), paratypic female (USNM 109623), Horton H. Hobbs, Jr. (coll.).

DISTRIBUTION: WOODVILLE, OCALA (Upper Suwannee, Lower Suwannee, Orange Lake, Marion, Withlacoochee, Gulf Coastal Lowlands), and MIAMI FAUNAS. This amphipod is widespread in limestone areas of the Florida peninsula, east of the Apalachicola River, and on occasions can be abundant at certain sites. Its distribution coincides with that of *Crangonyx grandimanus*. The species was listed as a Species of Special Concern by the Florida Committee on Rare and Endangered Plants and Animals (Franz 1982) because of its dependence on specialized subterranean habitats and its limited distribution; it is a candidate for federal listing (Wood 1992).

SPECIFIC LOCALITIES: *Alachua County*: Cave in riverbed at High Springs (=River Bed Cave?) (JRH), Crumbly Sink (JRH), Devils Hole (JRH), Dudleys Cave (JRH), Goat Sink (JRH, Hobbs 1942*b*), High Springs Cave (JRH), Huggins Cave-type locality (USNM, Shoemaker 1941, Bousfield 1963), Still Sink (Warren 1961, not seen by JRH)), well (Archie Carr Farm) near Micanopy (JRH). *Citrus County*: Sweet Gum Cave (JRH, Hobbs 1942*b*). *Columbia County*: Bussey's Sink (JRH), River Bed Cave (Hobbs 1942*b*, Warren 1961). *Dade County*: well, Little Bird Nursery and Garden Store (JRH). *Gilchrist County*: Devil's Eye and Ear Spring (JRH). *Hernando County*: Eagle's Nest Sink (JRH). *Leon County*: Sullivan's Tunnel (JRH). *Levy County*: Friedman's Sink (JRH), Manatee Springs (JRH), well at Chiefland (JRH). *Madison County*: Madison Blue Spring (JRH). *Marion County*: Chert Cave (JRH), Hell Hole (JRH), Indian Cave (Bousfield 1963, JRH), Orange Lake Cave (JRH), Roosevelt Cave (Warren 1961), Sunday

Sink (JRH). *Pasco County*: Nexus Sink (JRH), 38 m (125 ft) well at Lacoochee (JRH). *Suwannee County*: Challenge Sink (JRH), Cisteen Sink (JRH), Orange Grove Sink (JRH), Peacock Springs Cave System (JRH), Sim's Sink (JRH). *Wakulla County*: McBride Slough (JRH), River Sinks (JRH), Sally Ward Spring (JRH), Shepard Blue Spring (JRH).

ETYMOLOGY: Named for Horton H. Hobbs, Jr., the collector of the type series (Shoemaker 1941).

REMARKS: Holsinger (1972) placed this unique species in the monotypic *hobbsi* group.

REFERENCES: Franz 1982 (conservation status); Holsinger 1972 (records, key), 1977 (taxonomy); Shoemaker 1941 (type description); Warren 1961 (records).

Order DECAPODA

Family PALAEMONIDAE

Palaemonetes cummingi Chace

SQUIRREL CHIMNEY CAVE SHRIMP

Palaemonetes (*Palaemonetes*) *cummingi* Chace, 1954. Journal of Washington Academy of Science 44(10):319-323. TYPE LOCALITY: Squirrel Chimney, Alachua County, Florida. Holotype, female (USNM 95795), Robert B. Cumming (coll.), 11 July 1953.

Palaemonetes cummingi.—Warren, 1961:6.

OTHER COMMON NAMES: Florida Cave Shrimp.

DISTRIBUTION: OCALA FAUNA (Upper Suwannee). Known only from the type locality. This cave shrimp was proposed as Threatened by the Florida Committee on Rare and Endangered Plants and Animals (Franz 1982) and was listed as Threatened on 21 June 1990 under provisions of the U. S. Endangered Species Act of 1973, as amended (Anonymous 1990). Because it is known from only one site in a rapidly developing urban area, the shrimp is vulnerable to extinction from groundwater contamination and deterioration of the surface habitat around the Squirrel Chimney sinkhole. Divers failed to find shrimps after an extensive search in this underwater cave in October 1992 (Morris and Butt 1992).

ETYMOLOGY: Named in honor of Robert B. Cumming, the collector of the first specimen (Chace 1954).

REFERENCES: Chace 1954 (type description); Dobkin 1971 (larval development); Franz 1982 (conservation status); Hobbs et al. 1977 (description); Strenth 1976 (taxonomy).

Family CAMBARIDAE

Procambarus (*Leconticambarus*) *milleri* Hobbs

MIAMI CAVE CRAYFISH

Procambarus milleri Hobbs, 1971. Quarterly Journal of Florida Academy of Science 34(2):115. TYPE LOCALITY: well at the Little Bird Nursery and Garden Store, Miami, Dade County, Florida. Holotype (USNM 131257), Billy R. Drummond, George C. Miller, and others (colls.), 2 May 1968. Morphotype (USNM 131258), 16 paratypes.

Procambarus (*Leconticambarus*) *milleri*.—Hobbs, 1972:7 (by implication).

DISTRIBUTION: MIAMI FAUNA. Known from two localities in the Miami area. This species was recently collected at another site in the Miami area by W. F. Loftus and P. Radice. The new specimens are currently under study, and more information will become available at a future date (W. F. Loftus, personal communication, Everglades National Park). This crayfish is potentially vulnerable to extinction from groundwater pollution and salt water intrusion, because its entire range lies within a major urban area. The crayfish is listed as a Species of Special Concern by the Florida Committee on Rare and Endangered Plants and Animals (Franz 1982).

SPECIFIC LOCALITIES: *Dade County*: well at Little Bird Nursery and Garden Store-type locality (USNM), 9-m deep well northeast of Homestead (USNM).

ETYMOLOGY: Named in honor of George C. Miller who together with Billy R. Drummond forwarded the type specimens to Horton H. Hobbs, Jr. Mr. Miller was a long-time friend of Hobbs and fellow student of crayfish (Hobbs 1971).

REFERENCES: Caine 1974 (evolution); Franz 1982 (conservation status); Franz and Lee 1982 (distribution, evolution, records); Hobbs 1971 (original description); Hobbs et al. 1977 (description, records); Hobbs and Hobbs 1991 (key).

Procambarus (*Lonnbergius*) *acherontis* (Lonnberg)

ORLANDO CAVE CRAYFISH

Cambarus acherontis Lonnberg, 1895. Bihang till Koniglische Svenska Veterskaps-Akademiens Handlingar 22:6. TYPE LOCALITY: subterranean rivulet about 12.8 m (42 ft) from the surface in a hand-dug well, Lake Brantley, Seminole County, Florida. Syntypes (ZIAS 1/4412) (two Form II males), one of which is still extant (Hobbs 1989).

Cambarus (*Cambarus*) *acherontis*.—Ortmann, 1905:102.

Cambarus (*Ortmannicus*) *acherontis*.—Fowler, 1912:341 (by implication).

Procambarus acherontis.—Hobbs, 1942*a*:342 (by implication).

Procambarus (*Lonnbergius*) *acherontis*.—Hobbs, 1972:8

OTHER COMMON NAMES: Orange-Seminole Cave Crayfish. We prefer the use of the name Orlando Cave Crayfish because the entire world distribution occurs within the Orlando metropolitan area. It brings into focus the precarious conservation status of this species in one of the most rapidly expanding urban areas in Florida.

DISTRIBUTION: ST. JOHNS RIVER FAUNA (Wekiva). This crayfish is found in groundwater habitats in a limestone area along the Wekiva River in Orange and Seminole counties, Florida. It was proposed as Threatened by the Florida Committee on Rare and Endangered Plants and Animals (Franz 1982).

SPECIFIC LOCALITIES: *Orange County*: Apopka Blue Hole (USNM), Wekiwa Springs (USNM), well at Long Lake (RF). *Seminole County*: Palm Springs (USNM), well at Altamonte Springs (RF), well at Lake Brantley-type locality (ZIAS, Lonnberg 1894, 1895).

ETYMOLOGY: The name *acherontis* apparently refers to "Acheron," the name of the river of woe in Greek and Roman mythology, one of the five rivers that surrounds Hades, across which Charon ferried the dead.

REFERENCES: Cooper 1965*a* (records); Franz 1982 (conservation status, records); Franz and Lee 1982 (distribution, evolution); Hobbs 1942*b* (description, records); Hobbs et al. 1977 (description, records); Hobbs and Hobbs 1991 (key); Lonnberg 1894, 1895 (original description); Walton and Hobbs 1959 (Ul as commensal).

Procambarus (*Lonnbergius*) *morrisi* Hobbs and Franz
PUTNAM COUNTY CAVE CRAYFISH

Procambarus (*Lonnbergius*) *morrisi* Hobbs and Franz, 1990. Proceedings of Biological Society of Washington 104(1):56-62. TYPE LOCALITY: Devil's Sink, 7.1 km west of Interlachen, Putnam County, Florida. Holotype, allotype, morphotype (USNM 220374, 220375, 220376, respectively), 12 paratypes (USNM), Tom Morris (coll.), 9 May 1989, Tom Morris and Paul Smith (colls.), 6-8 March 1990.

DISTRIBUTION: ST. JOHNS RIVER FAUNA (Lake George). Known only from the type locality.

ETYMOLOGY: This crayfish is named in honor of Tom Morris, biologist and cave diver, who with Paul Smith collected the type

series and provided detailed information on Devils Sink (Hobbs and Franz 1990).

REFERENCES: Franz and Franz 1990 (listed as a new cavernicolous crayfish from Putnam County); Hobbs and Franz 1990 (original description).

Procambarus (*Ortmannicus*) *attiguus* Hobbs and Franz
SILVER GLEN SPRINGS CAVE CRAYFISH

Procambarus (*Ortmannicus*) *attiguus* Hobbs and Franz 1992. Proceedings of Biological Society of Washington 105(2):359-365. TYPE LOCALITY: Silver Glen Springs, 14.4 km northwest of Astor Park, Marion County, Florida. Holotype, allotype, and juvenile female paratype (USNM 220683, 220684, and 220685, respectively), Tom Morris (coll.), 16 August 1990 (holotype only).

DISTRIBUTION: ST. JOHNS RIVER FAUNA (Lake George). Known only from the type locality. One specimen (USNM) was taken by Mike Spelman and Mike Hill on 5 June 1991 from Silver Glen Well Cave that lies on the west side of the main spring pool and represents a secondary outflow of the main spring cave.

ETYMOLOGY: *Attiguus* from Latin meaning neighboring; alluding to the geographic proximity of the type, and only known locality, of this species to *Procambarus delicatus* at Alexander Springs, as well as to the close kinship of these two crayfishes (Hobbs and Franz 1992).

REFERENCES: Hobbs and Franz 1992 (original description).

Procambarus (*Ortmannicus*) *delicatus* Hobbs and Franz
BIG CHEEKED CAVE CRAYFISH

Procambarus (*Ortmannicus*) *delicatus* Hobbs and Franz, 1986. Journal of Crustacean Biology 6(3):509. TYPE LOCALITY: Alexander Springs, 9 km south of Astor Park, Lake County, Florida. Holotype, allotype, paratype (USNM 218528, 144848, 145578, respectively); holotype, Jeffrey B. Smith and Don Haren II (colls.).

OTHER COMMON NAMES: Alexander Springs Cave Crayfish.

DISTRIBUTION: ST. JOHNS RIVER FAUNA (Lake George). Known only from the type locality.

ETYMOLOGY: The name *delicatus* (Latin= dainty) refers to the delicate mien of this species.

REFERENCES: Franz and Lee 1982 (distribution); Hobbs and Franz 1986 (original description), 1992 (comparison with *attiguus*); Hobbs and Hobbs 1991 (key); Relyea et al. 1976 (record).

Procambarus (*Ortmannicus*) *erythrops* Relyea and Sutton
SANTA FE CAVE CRAYFISH

Procambarus (*Ortmannicus*) *erythrops* Relyea and Sutton, 1975. Tulane Studies in Zoology and Botany 19(1-2):8. TYPE LOCALITY: Sim's Sink, 1.7 km (1 mi) west of junction of U.S. Highways 27 and 129, 0.17 km (0.1 mi) south of U.S. Highway 27, Suwannee County, Florida. Holotype, allotype, morphotype (USNM 133471, 133472, 133473, respectively), 14 paratypes (USNM, RNHL, BMNH).

OTHER COMMON NAMES: Red-eyed Cave Crayfish, Sim Sink Cave Crayfish.

DISTRIBUTION: OCALA FAUNA (Upper Suwannee). Restricted to groundwater habitats in southern Suwannee County, Florida.

SPECIFIC LOCALITIES: *Suwannee County*: Azure Blue Sink (USNM), Bufo Sink (Relyea and Sutton 1975), Hildreth Cave (USNM), Quarry Sink (B. Sutton), Sim's Sink-type locality (USNM, Relyea and Sutton 1975).

ETYMOLOGY: The species name *erythrops* from "Erythros" (Gr.) for the color red, and "Ops" (Gr.) for eye; alluding to the red pigment spot in the eye of this crayfish (Relyea and Sutton 1975).

REMARKS: Bufo Sink, 0.33 km (0.2 mi) south of (Sims Sink), was listed as an unnamed sink in the original description (B. Sutton, personal communication, Gainesville, Florida).

REFERENCES: Franz 1982 (conservation status); Franz and Lee 1982 (distribution, evolution, records); Hobbs et al. 1977 (description, records); Hobbs and Hobbs 1991 (key); Mellon 1977 (eye structure); Mellon and Lnenicka 1980 (eye structure); Relyea and Sutton 1975 (original description).

Procambarus (*Ortmannicus*) *franzi* Hobbs and Lee
ORANGE LAKE CAVE CRAYFISH

Procambarus (*Ortmannicus*) *franzi* Hobbs and Lee, 1976. Proceedings of Biological Society of Washington 89(32):384. TYPE LOCALITY: Orange Lake Cave, 0.64 km (0.4 mi) south of junction of U.S. Highway 441 and State Route 318, Marion County, Florida. Holotype, allotype, morphotype, (USNM 146992, 146993, 146994, respectively), seven paratypes (USNM).

DISTRIBUTION: OCALA FAUNA (Orange Lake). Restricted to groundwater habitats in the vicinity of Orange Lake in northern Marion County, Florida.

SPECIFIC LOCALITIES: *Marion County*: Hell Hole (USNM), Orange Lake Cave-type locality (USNM, Hobbs and Lee 1976), Orange

Lake Quarry solution pipes (DSL), Trade Winds Farm Cave (USNM).

ETYMOLOGY: Named for Richard Franz who with D. S. Lee collected the type series at Orange Lake Cave (Hobbs and Lee 1976).

REFERENCES: Dickson and Franz 1980 (gill respiration); Franz 1982 (conservation status); Franz and Lee 1982 (evolution, distribution, records); Hobbs and Lee 1976 (original description); Hobbs et al. 1977 (description, records); Hobbs and Hobbs 1991 (key).

Procambarus (*Ortmannicus*) *horsti* Hobbs and Means
BIG BLUE SPRINGS CAVE CRAYFISH

Procambarus horsti Hobbs and Means, 1972. Proceedings of Biological Society of Washington 84(46): 401. TYPE LOCALITY: Big Blue Spring (tributary to the Wacissa River), 3.7 km (2.2 mi) south of the crossroads in the town of Wacissa, Jefferson County, Florida. Holotype, allotype, morphotype (USNM 132043, 132044, 132045, respectively), four paratypes (USNM), Michael N. Horst (coll.), October 1970.

Procambarus (*Ortmannicus*) *horsti*.—Holt, 1973*b*:246.

OTHER COMMON NAMES: Horst's Cave Crayfish.

DISTRIBUTION: WOODVILLE FAUNA. Confined to subterranean habitats in limestone areas of the Woodville Karst Plain in Jefferson, Leon, and Wakulla counties, Florida.

SPECIFIC LOCALITIES: *Jefferson County*: Big Blue Spring (Wacissa River)-type locality (USNM). *Leon County*: well 7.5 km (4.5 mi) east of Tallahassee (USNM). *Wakulla County*: Shepards Blue Spring (USNM). Questionable record from Wakulla Spring (see Morris 1989).

ETYMOLOGY: Named for Michael N. Horst who donated the type series to the U.S. National Museum of Natural History (Hobbs and Means 1972).

REMARKS: This crayfish is a member of the *pallidus* complex (Franz and Lee 1982).

REFERENCES: Franz 1982 (conservation status); Franz and Lee 1982 (evolution, distribution, records); Hobbs and Means 1972 (original description); Hobbs et al. 1977 (description, records); Hobbs and Hobbs 1991 (key); Morris 1989 (records).

Procambarus (*Ortmannicus*) *leitheuseri* Franz and Hobbs
COASTAL LOWLANDS CAVE CRAYFISH

Procambarus (*Ortmannicus*) *leitheuseri* Franz and Hobbs, 1983. Proceedings of Biological Society of Washington 96(2): 323. TYPE LOCALITY: Eagle's Nest Sink, 6.6 km (4.0 mi) northwest of junction

of U.S. Highway 19 and State Road 50, Hernando County, Florida. Holotype, allotype, and morphotype (USNM 178361, 178582, 178585, respectively), three paratypes (UF specimens transferred to USNM), A. T. Leitheuser and L. F. Collins (colls.).

DISTRIBUTION: OCALA FAUNA (Gulf Coastal Lowlands). Restricted to deep groundwater habitats in western Hernando and Pasco counties, Florida.

SPECIFIC LOCALITIES: *Hernando County*: Die Polders 2 Sink (USNM), Die Polders 3 Sink (USNM), Eagle's Nest Sink-type locality (USNM), Little Salt Springs (ATL), Little Springs (ATL). *Pasco County*: Arch Sink (USNM), Black Hole (USNM), Nexus Sink (USNM).

ETYMOLOGY: Named for its discoverer, Arthur T. Leitheuser, who has added much to our knowledge of the distribution of troglobitic crayfishes of Florida (Franz and Hobbs 1983).

REMARKS: This crayfish is a member of the *lucifugus* complex.

REFERENCES: Franz and Hobbs 1983 (original description); Hobbs and Hobbs 1991 (key).

Procambarus (*Ortmannicus*) *lucifugus lucifugus* (Hobbs)
WITHLACOOCHEE LIGHT-FLEEING CAVE CRAYFISH

Cambarus acherontis.—Faxon, 1898:645.

Cambarus lucifugus lucifugus Hobbs, 1940*a*. Proceedings of U.S. National Museum 89(3097):398. TYPE LOCALITY: Gum Cave (=Sweet Gum Cave), 11.2 km (7 mi) southwest of Floral City, Citrus County, Florida. Holotype, allotype, "morphotype" (USNM 77916, 77917, 77918, respectively), 32 paratypes (MCZ, USNM, FSBC, OSM), Kilby, Sherman, Hobbs Jr. (colls., holotype), 1 May 1936.

Procambarus lucifugus lucifugus.—Hobbs, 1942*a*:343 (by implication).

Procambarus (*Ortmannicus*) *lucifugus lucifugus*.—Hobbs, 1972:9.

OTHER COMMON NAMES: Florida Cave Crayfish (in part).

DISTRIBUTION: OCALA FAUNA (Withlacoochee). Restricted to groundwater habitats in Citrus and northern Hernando counties, Florida.

SPECIFIC LOCALITIES: *Citrus County*: Sweet Gum Cave-type locality (USNM, Hobbs 1940*a*). *Hernando County*: cave 23.3 km (14 mi) north of Weekiwachee Springs (USNM).

ETYMOLOGY: *Lucifugus* meaning light-fleeing, referring to its habitation of unlighted cave environments.

REMARKS: This crayfish is a member of the *lucifugus* complex (Franz and Lee 1982).

REFERENCES: Franz 1982 (conservation status); Franz and Lee 1982 (evolution, distribution, records); Hobbs 1940*a* (original description), 1942*b* (description, records); Hobbs et. al. 1977 (description, records); Hobbs and Hobbs 1991 (key); Hobbs III 1992 (photograph).

Procambarus (*Ortmannicus*) *lucifugus alachua* (Hobbs)
ALACHUA LIGHT-FLEEING CAVE CRAYFISH

Cambarus lucifugus alachua Hobbs, 1940*a*. Proceedings of U.S. National Museum 89(3097):402. TYPE LOCALITY: a small cave, Hog Sink, about 16.7 km (10 mi) west of Gainesville, Alachua County, Florida. Holotype, allotype, "morphotype" (USNM 76592), 50 paratypes (USNM, FSBC), H. H. Hobbs Jr. (coll., holotype), 30 November 1937.

Procambarus lucifugus alachua.—Hobbs, 1942*a*:343 (by implication).

Procambarus (*Ortmannicus*) *alachua*.—Hobbs, 1972:10.

OTHER COMMON NAMES: Florida Cave Crayfish (in part).

DISTRIBUTION: OCALA FAUNA (Upper Suwannee). Restricted to groundwater habitats in the Western Valley (Newberry Karst Plain) of western Alachua and northeastern Levy counties, Florida.

SPECIFIC LOCALITIES: *Alachua County*: Bat Cave (USNM), Crumbly Sink (USNM), Cueva Fria (USNM), Dudley Cave (USNM), Goat Sink (USNM), Hog Sink-type locality (USNM), Martin's Cave (Relyea and Sutton 1974), Protheroe Sink (Warren 1961), Seven Chimneys Sink (RF), Squirrel Chimney (USNM), Tusk Cave (USNM). *Levy County*: Gunpowder Cave (USNM), Williston Blue Sink (USNM).

ETYMOLOGY: The subspecific name refers to Alachua County, Florida, the area where most of the specimens of this race have been collected (RF).

REMARKS: This crayfish is a member of the *lucifugus* complex (Franz and Lee 1982).

REFERENCES: Franz 1982 (conservation status); Franz and Lee 1982 (evolution, distribution, records, photograph); Hobbs 1940*a* (original description), 1942*b* (description, records); Hobbs et al. 1977 (description, records); Hobbs and Hobbs 1991 (key); Holt 1973*b* (Cl as commensal); Lee 1969*c* (as prey).

Procambarus l. lucifugus X *l. alachua*
Intergrade populations of LIGHT-FLEEING CAVE CRAYFISHES

DISTRIBUTION: OCALA FAUNA (Lower Suwannee and Marion). The two intergrade populations appear isolated from one another and from the *P. l. lucifugus* population on the western side of the Withlacoochee

River and *P. l. alachua* population in Alachua and northeast Levy counties. The taxonomic relationships between the various populations are in need of further study.

SPECIFIC LOCALITIES: Lower Suwannee population in *Gilchrist County*: Kelley Sinks (RF), Old Walker Farm Sink (USNM), Robert's Cave (Warren 1961). *Levy County*: Friedman's Sink (USNM), Manatee Springs (USNM). Marion population in *Marion County*: Briar Cave (USNM), Chert Cave (USNM), Eickelberger Cave (USNM), Indian Cave (USNM), Ocala Caverns (USNM), Redding Catacombs (RF), Roosevelt Cave (USNM), Silver Springs (USNM), Steeple Cave (RF), Sunday Sink (USNM), Waldo Cave (Warren 1961).

REFERENCES: Cooper 1965*b* (records); Franz 1982 (conservation status); Franz and Lee 1982 (evolution, distribution, records); Hobbs 1942*b* (description, records); Hobbs et al. 1977 (description, records); Holt 1973*b* (Cl as commensal).

Procambarus (*Ortmannicus*) *orcinus* Hobbs and Means

WOODVILLE KARST CAVE CRAYFISH

Procambarus pallidus.—Hobbs 1958:81 (part).

Procambarus orcinus Hobbs and Means, 1972. Proceedings of Biological Society of Washington 84(46):394. TYPE LOCALITY: Gopher Sink, 5 km (3.1 mi) southwest of State Road 61 and 0.3 km (0.2 mi) east of State Route 369, Leon County, Florida. Holotype, allotype, morphotype (USNM 132031, 132032, 132033, respectively), 21 paratypes (USNM).

Procambarus (*Ortmannicus*) *orcinus*.—Hobbs, 1972:58.

DISTRIBUTION: WOODVILLE FAUNA. Apparently restricted to groundwater habitats in the limestone areas of the western Woodville Karst Plain in Leon and Wakulla counties, Florida.

SPECIFIC LOCALITIES: *Leon County*: Bird Sink Swallet (USNM), cave 5 km (3 mi) north of Woodville (USNM), Clay Sink (USNM, Warren 1961), Culley's Cave (USNM), Falcon's Nest (USNM), Gopher Sink-type locality (USNM, Hobbs and Means 1972), Little Dismal Sink (USNM), Osgood Sink (USNM), Sullivan's Tunnel (USNM). *Wakulla County*: Emerald Sink (USNM), Indian Springs (USNM), McBride Spring (USNM), Sally Ward Spring (Morris 1989), River Sinks (Caine 1978), Wakulla Springs (USNM).

ETYMOLOGY: The species name *orcinus* (L.) for the nether world, referring to the spelean habitat of this crayfish (Hobbs and Means 1972).

REMARKS: Franz and Lee (1982) listed this crayfish as a member of the *pallidus* complex.

REFERENCES: Caine 1978 (ecology, records); Franz 1982 (conservation status, records); Franz and Lee 1982 (evolution, distribution, records); Hobbs and Means 1972 (original description); Hobbs et al. 1977 (description, records); Hobbs and Hobbs 1991 (key); Holt 1973*b* (Cl as commensal).

Procambarus (*Ortmannicus*) *pallidus* (Hobbs)

PALLID CAVE CRAYFISH

Cambarus acherontis.—Hobbs, 1937:154.

Cambarus acherontis pallidus Hobbs, 1938:90-91. Nomen nudum.

Cambarus pallidus Hobbs, 1940*a*. Proceedings of U.S. National Museum 89(3097):394. TYPE LOCALITY: Warren Cave, 17.6 km (11 mi) northwest of Gainesville, Alachua County, Florida. Holotype, allotype (both listed as USNM 76591), 13 paratypes (USNM, MCZ, FSBC), H. H. Hobbs, Jr. et al. (colls., holotype).

Procambarus pallidus.—Hobbs, 1942*a*:343 (by implication).

Procambarus (*Ortmannicus*) *pallidus*.—Hobbs, 1972:10.

DISTRIBUTION: OCALA FAUNA (Upper Suwannee). Groundwater habitats in limestone areas of the (northern) Withlacoochee River, upper Suwannee River, lower Santa Fe River, and the Newberry Karst Plain (western Alachua and northeast Levy counties), Florida. The species may eventually be discovered in karst areas along the Withlacoochee River in southern Georgia because the M2 Cave site in Madison County (Florida) lies 9 km (6 mi) south of the Florida-Georgia border.

SPECIFIC LOCALITIES: *Alachua County*: Alachua Sink (USNM), Chimney Sink (USNM), Cueva Fria (USNM), Devil's Hole (USNM), Goat Sink (USNM), Hertzog Cave (USNM), High Springs Cave (USNM), Hog Sink (USNM), Hornsby Sink (USNM), Hornsby Spring (ATL), McGeehee Blue Hole Cave (ATL), Pallidus Sink (USNM), Protheroe Sink (Warren 1961), Squirrel Chimney (USNM), Still Sink (USNM), Warren Cave-type locality (USNM, Hobbs 1940*a*), well at Fort Clark (USNM), 32-Foot Cave (RF). *Columbia County*: Big Grungy Swallet (USNM), Big Room Cave (TM), Bussey's Sink (USNM), Columbia Spring (TM), Fossil Cave Sink (TM), Riverbed Cave (USNM), Rose Creek Swallet (USNM), Rose Creek Overflow Cave (TM), Russell's Rub (TM), Shiloh Cave (USNM). *Gilchrist County*: Devil's Eye and Ear Spring (USNM), Ginnie Springs (RF), Rocky Bluff Spring (USNM). *Hamilton County*: Adams Spring (TM), Corbett Spring Cave (USNM), Firecracker Cave (USNM), Overflow Cave (USNM), Pott Spring (TM), Rossiter Spring (TM), Shallow Spring (ATL), Underhung Sink (USNM). *Lafayette County*: Alligator Rescue Spring (TM), Allens Mill Pond Spring (USNM), Kassermans Sink (ATL), Lafayette Blue Spring (ATL),

Main Sink (ATL), Owens Spring (TM), Perry Spring (ATL), Ruth Spring (USNM), Troy Spring (USNM). *Levy County*: Archer Caves (RF), Devils Den (USNM). *Madison County*: Baseline Cave (USNM), Madison Blue Spring (ATL), M2 Blue Cave (USNM), Suwannacoochee Spring (USNM), Thunderhole Sink (USNM). *Suwannee County*: Anderson Spring (TM), Bonnett Spring (TM), Challenge Sink (TM), Charles Spring (TM), Cisteen Sink (USNM), Cow Spring Cave (USNM), Crazy Horse Sink (USNM), Double Sink (ATL), Edwards Spring (USNM), Falmouth Spring (JB), Ghoul Sink (USNM), Irvine Slough Spring (TM), Lineater Spring (TM), Little River Spring (USNM), Mirkwood Sink (USNM), Olsen Sink (TM), Orange Grove Sink (USNM), Peacock Spring (USNM), unnamed sink in Peacock System (USNM), Peacock Sink 3 (JB), Pot Hole (JB), Register Sink (ATL), Sandbag Spring (TM), Smith Sink (ATL), Stick Sink (ATL), Telford Springs (USNM), Ten Mile Hollow Cave (TM), Water Hole 3 Sink (JB).

ETYMOLOGY: The name *pallidus* refers to the pallid appearance of this cave species (RF).

REMARKS: The record from Eichelberger Cave in Marion County (Hobbs et al. 1977) was questioned by Franz and Lee (1982). Crayfishes from the Big Grungy population are less tuberculate and spiniform than more typical *P. pallidus* (HHH). We encourage the collections of more specimens from this site in order to resolve its taxonomic status. *P. pallidus* is a member of the *pallidus* complex (Franz and Lee 1982).

REFERENCES: Cooper 1965*b* (records); Dickson and Franz 1980 (gill respiration); Franz 1982 (conservation status, records); Franz and Lee 1982 (evolution, distribution, records); Hobbs 1940*a* (original description), 1942*a*, 1942*b* (descriptions, records); Hobbs et al. 1977 (descriptions, records); Hobbs and Hobbs 1991 (key); Relyea and Sutton 1973*a* (egg-bearing); Streever 1992*b* (crayfish kill at Peacock Springs); Walton and Hobbs 1959 (Cl as commensal).

Troglocambarus maclanei Hobbs
NORTHERN SPIDER CAVE CRAYFISH

Troglocambarus maclanei Hobbs, 1942*a*. American Midland Naturalist 28(2):345. TYPE LOCALITY: Squirrel Chimney, 17.6 km (11 mi) northwest of Gainesville, Alachua County, Florida. Holotype, allotype, paratypic male (form II) (USNM 79385, 79386, 79387, respectively), other paratypes (MCZ, USNM). H. H. Hobbs (coll., holotype), 25 March 1941.

OTHER COMMON NAMES: Spider Cave Crayfish (in part), McLane's Cave Crayfish.

DISTRIBUTION: OCALA FAUNA (Upper Suwannee, Lower Suwannee, Orange Lake, Marion, Withlacoochee, and Gulf Coastal Lowlands). *Troglocambarus maclanei* is the most widely distributed troglobitic crayfish in Florida. It ranges from southern Suwannee County, southwestward to Pasco County. Based on the sighting of a shrimp-like crayfish in Knight Sink, near Tarpon Springs, this species may range south into Pinellas County (P. Heinerth, personal communication, Hudson, Florida).

SPECIFIC LOCALITIES: *Alachua County*: Goat Sink (USNM), Hertzog Cave (USNM), Squirrel Chimney-type locality (USNM, Hobbs 1942*a*). *Columbia County*: Columbia Spring (TM), Fossil Cave Sink (TM). *Gilchrist County*: Devil's Eye and Ear Spring (USNM). *Hernando County*: Eagle's Nest Sink (USNM). *Levy County*: Manatee Springs (USNM), Peanut Cave (USNM). *Marion County*: Chert Cave (USNM), Indian Cave (USNM), Orange Lake Cave (USNM), Sunday Sink (RF), Trade Winds Farm Sink (USNM). *Suwannee County*: Azure Blue Sink (USNM), Sim's Sink (USNM).

ETYMOLOGY: Named for William A. McLane, collector of the original specimens.

REFERENCES: Cooper 1965*b* (records); Franz 1982 (conservation status, records, photograph); Franz and Lee 1982 (evolution, distribution, records); Franz and Franz 1990 (distribution); Hobbs 1942*a* (original description, photograph), 1942*b* (description, records, photograph); Hobbs et al. 1977 (description, records); Hobbs and Hobbs 1991 (key); Holt 1973*b* (Cl as commensal); Mohr and Poulson 1966 (photo).

Troglocambarus sp.
ORLANDO SPIDER CAVE CRAYFISH

DISTRIBUTION: ST. JOHNS RIVER FAUNA (Wekiva). Known only from Apopka Blue Sink, Orange County, Florida (USNM). This cave may represent an upstream part of the Rock Spring Cave System. REMARKS: Specific identification of this crayfish awaits the collection of Form I males (HHH).

REFERENCES: Hobbs III 1992 (photograph).

Cambarus (*Jugicambarus*) *cryptodytes* Hobbs
APALACHICOLA CAVE CRAYFISH

Cambarus (*Cambarus*) *cryptodytes* Hobbs. 1941. American Midland Naturalist 26(1):110. TYPE LOCALITY: well on the R. W. Williams farm, 3.2 km (2 mi) south of Graceville, Jackson County,

Florida. Holotype, allotype, morphotype (USNM 79339, 79340, 79343, respectively), five paratypes (MCZ, USNM).

Cambarus cryptodytes.—Hobbs, 1942*a*:354.

Cambarus (*Jugicambarus*) *cryptodytes*.—Hobbs, 1969:107.

OTHER COMMON NAMES: Marianna Lowlands Cave Crayfish, Dougherty Plain Cave Crayfish. We propose the new common name, Apalachicola Cave Crayfish, which we believe better reflects this species and its distribution.

DISTRIBUTION: APALACHICOLA FAUNA (Marianna and Southwest Georgia). Groundwater areas of northcentral Jackson County, Florida, and Decatur County, Georgia.

SPECIFIC LOCALITIES: *Jackson County*: Cave-in-Woods (RF), Ellis Cave (USNM), Gerard Cave (USNM), Gerome's Cave (Hobbs et al. 1977), Hole-in Wall (USNM), Jackson Blue Spring (USNM), Judges Cave (Warren 1961), Miller's Cave (DSL), Milton's Well Cave (DSL), Pool Cave (Hobbs et al. 1977), Pottery Cave (Warren 1961), Ray's Cave (FNAI), Rockwell Cave (Hobbs et al. 1977), Soda Straw Cave (Warren 1961), Twin Cave (USNM), Vetter's Cave (Hobbs et al. 1977), Waddell's Mill Cave (USNM), Washed-out Cave (Warren 1961), well 3.3 km (2 mi) south of Graceville-type locality (USNM, Hobbs 1941). *Decatur County* (Georgia): Climax Cave (USNM).

REMARKS: The type locality was an 18.2-m (60 ft) deep well on the farm of Robert W. Williams. During a 1983 visit with Mr. Robert Williams, who obtained the original series for Hobbs, we learned that the well had been filled many years before. The Washington County specimen mentioned by Hobbs (1989), we believe, must have come from Jackson County (probably Gerards Cave), based on road mileage listed with the specimen. Unusual specimens of *Cambarus* were recently collected at Blue Hole in Florida Caverns State Park by park rangers and at Vortex Spring in Holmes County that may represent one or more distinct taxon (HHH). Adult material is necessary before this taxonomic problem can be resolved.

ETYMOLOGY: Crypto from the Greek=hidden, dytes=to dwell, referring to the crayfish dwelling in the cave environment.

REFERENCES: Franz 1982 (conservation status); Franz and Lee 1982 (evolution, distribution, records); Harris 1968 (associate of *Haideotriton*); Hobbs 1941 (original description), 1942*a*, 1942*b* (description, records), 1969 (taxonomy), 1981 (description, records in Georgia); Hobbs et al. 1977 (description, records); Hobbs and Hobbs 1991 (key); Hobbs and Walton 1968 (Uw as commensal); Pylka and Warren 1958 (records); Warren 1961 (records).

Class INSECTA
Order COLLEMBOLA
Family Entomobryidae
Pseudosinella pecki Christiansen and Bellinger
MARIANNA CAVE SPRINGTAIL

Pseudosinella pecki Christiansen and Bellinger, 1980. Grinnell College Special Paper: 988-989pp. TYPE LOCALITY: Miller's Cave, (Florida) Caverns State Park, Jackson County, Florida. S. B. Peck (coll.), 28 December 1965.

DISTRIBUTION: APALACHICOLA FAUNA (Marianna Lowlands and Southwest Georgia). Known from caves in Jackson County (Florida), Jackson County (Alabama), and Decatur, Randolph, and Stewart counties, Georgia (Christiansen and Bellinger 1980).

REMARKS: According to Christiansen and Bellinger (1980), this species is probably a troglobitic derivative of *Pseudosinella argentea*.

ETYMOLOGY: Named for Stewart B. Peck, collector of the collembolan.

REFERENCES: Peck 1970 (record); Christiansen and Bellinger 1980 (original description).

Class ARCHNIDA
Order ARANEA
Family Linyphiidae
Islandiana sp.
MARIANNA CAVE SHEETWEB WEAVER SPIDER

DISTRIBUTION: APALACHICOLA FAUNA (Marianna Lowlands). This undescribed spider is known only from Miller's Cave, Florida Caverns State Park, Jackson County, Florida. REMARKS: This spider is currently under study by W. T. Gertsch (S. B. Peck, personal communication, Carlton University).

REFERENCES: Peck 1970 (record).

Phylum CHORDATA
Class AMPHIBIA
Order CAUDATA
Family Plethodontidae
Haideotriton wallacei Carr
GEORGIA BLIND SALAMANDER

Haideotriton wallacei Carr, 1939. Occasional Papers of Boston Society of Natural History 8:335-336. TYPE LOCALITY: 60.8-m (200

ft) deep well in Albany, Dougherty County, Georgia. Holotype (MCZ 19875), Mr. Hummel (Dougherty County Sanitary Engineer) (coll.), 19 May 1939.

DISTRIBUTION: APALACHICOLA FAUNA (Marianna Lowlands and Southwest Georgia). Restricted to groundwater habitats in Jackson County, Florida, and Decatur and Dougherty counties, Georgia. This salamander was listed as Rare by the Florida Committee on Rare and Endangered Plants and Animals (Means 1978, 1992).

SPECIFIC LOCALITIES: FLORIDA, *Jackson County*: Cave-in-Woods (RF), Ellis Cave (DSL), Gerard's Cave (UF, USNM, NCSM, MCZ, Pylka and Warren 1958), Hole-in-Wall Cave (UF), Jackson Blue Spring (RF), Judges Cave (DSL), Miller's Cave (DSL), Milton's Well Cave (DSL), Twin Cave (RF), Washed-out Cave (Warren 1961). GEORGIA, *Decatur County*: Climax Cave (UF). *Dougherty County*: well in Albany (MCZ).

ETYMOLOGY: Named for H. K. Wallace, spider expert and Carr's colleague at the University of Florida, Gainesville.

REFERENCES: Carr 1939 (original description, photo); Bishop 1947 (description, photo); Brandon 1967 (description, literature); Dundee 1962 (response to metamorphic agent); Franz and Lee 1982 (crayfish associate); Harris 1968 (ecology); Hilton 1945 (skeleton); Hobbs III 1992 (photo); Lee 1969*a* (food habits), 1969*b*; Means 1977 (distribution), 1978, 1992 (conservation); Mohr and Poulson 1966 (photo); Peck 1973 (feeding efficiency); Valentine 1964 (morphology); Vandel 1965*a* (records); Wake 1966 (taxonomy); Pylka and Warren 1961 (record).

SUMMARY—The troglobitic fauna is composed of three isopods, two amphipods, one shrimp, 18 crayfishes (including two subspecies and two intergrade populations), one snail, one spider, one springtail, and one salamander. At least one species (*Caecidotea hobbsi*) occurs in groundwater habitats outside of caves, *per se*; the amphipods (*Crangonyx hobbsi* and *Crangonyx grandimanus*) also may use similar habitats, particularly in light of their wide geographic distributions. Several taxa in this list remain undescribed, due to the lack of critical material in collections. Faunas and assemblages are described in the section entitled *Obligate Cave Faunas and Karst Regions*.

ANNOTATED LIST OF OTHER CAVE-ASSOCIATED SPECIES

Phylum ANNILIDA
Class OLIGOCHAETA
Family Branchiobdellidae

Cambarincola leoni Holt (commensal on troglobites). *Alachua County:* on *Troglocambarus maclanei* from Squirrel Chimney; on *Procambarus lucifugus alachua* from Goat Sink. *Leon County*: on *Procambarus orcinus* from Gopher Sink. *Marion County*: on *Procambarus lucifugus* X *alachua* from Indian Cave. REMARKS: Holt (1973*b*) lists questionable records of this species on crayfishes from Squirrel Chimney (Alachua County), The Bat Hole (=Roberts Cave) (Gilchrist County), and Sim's Sink (Suwannee County).

Cambarincola manni Holt (accidental?). *Seminole County*: on *Procambarus acherontis* from Palm Spring (Holt 1973*b*). REMARKS: This annelid also has been retrieved from epigean crayfishes (*Procambarus alleni*, *P. fallax*, *P. paeninsulanus*) (Holt 1973*a*). Its presence on *Procambarus acherontis* may have been fortuitous because the specimens were acquired from crayfishes found in the spring pool at Palm Springs rather than from the adjacent cave environment. Infestations may have originated with surface crayfishes coinhabiting the spring pool.

Other Branchiobdellid Annelids. Unidentifiable branchiobdellid materials were collected on *Procambarus erythrops* (listed as *Procambarus lucifugus*) from Sim's Sink (Suwannee County), on *Procambarus horsti* from Big Blue Spring (Jefferson County), and on *Cambarus cryptodytes* from Gerard's Cave (Jackson County) and Climax Cave (Decatur County, GA) (Holt 1973*b*).

Other Annelids. Aeolosomatid oligochaetes were reported as part of the benthos from the cave tunnel and from the shallower regions of Vortex Blue Spring in Holmes County (Helfman 1986). Other caves with populations of aquatic annelids include: *Columbia County*: Rose Creek Swallet and Overflow (TM), Blue Sink (TM). *Hamilton County*: Shallow Spring (TM), Rossiter Spring (TM). *Madison County*: Thunderhole (TM). *Suwannee County*: Alligator Rescue Spring (TM), Bonnett Spring (TM), Charles Spring (TM), Irvine Slough Spring (TM), Peacock Springs (TM, Streever 1992*b*), Lineater Spring (TM), Telford Spring (TM), Water Hole Cave (TM).

Phylum MOLLUSCA
Class BIVALVIA
Family Cyrenidae

Corbicula fluminea (O.F.M.) (troglophile?). *Columbia County*: Siphon Creek Cave (TM); *Lafayette County*: Green Sink (TM); *Suwannee County*: Peacock Springs Cave (Streever 1992*a*).

Family Unionidae

Uniomerus obesus (Lee) (trogloxene?). *Columbia County*: Rose Creek Swallet (James D. Williams, personal communication, National Biological Survey, Gainesville, Florida). REMARKS: Mussels were collected alive buried in hard sand on the floor of this spring cave between the entrance and 60 meters penetration at water depths up to 12 meters. Their distribution in the cave probably is limited by the availability of filterable foods and the abilities of the host fish that carry the parasitic glochidia to penetrate subterranean habitats. The food supply may include the thin veneer of organic silt that covers the sand at this site.

Class GASTROPODA
Subclass PROSOBRANCHIA
Family Pleuroceridae

Elimia clenchi (Goodrich), Slackwater Elimia (trogloxene). *Holmes County*: Vortex Blue Spring (Helfman 1986). REMARKS: Reported as benthos from the cavern portion of Vortex Spring, but not from the deeper portions of the cave.

Elimia curvicostata (Reeve), Graphite Elimia (trogloxene). *Washington County*: Econfina Blue Springs Cave (RF, Thompson and Hershler 1991). REMARKS. This species was collected with the troglobitic snail, *Dasyscias franzi*, in the cave. *Elimia curvicostata* also occurred in the outflow and spring pool of Econfina Blue Spring; other snail species, including *Elimia athearni*, were found in the spring pool but not in the cave stream.

Family Hydrobiidae

Amnicola retromargo Thompson (troglophile). *Hamilton County*: Shallow Spring (FGT). REMARKS: These snails were collected approximately 60-600 meters inside the cave (water depth 12 meters) on boulders on the floor and on the cave walls in strong water currents. These specimens were lighter in color than individuals found in surface streams (F. G. Thompson personal communication, Florida Museum of Natural History).

Family Thiaridae

Melanoides tuberculatus (Mueller) (trogloxene?) *Citrus County*: Restinghouse Siphon (FGT). REMARKS: This snail is introduced from southeast Asia. It was found on the floor of this flooded cave between 0-60 meters penetration and at water depths up to 12 meters.

Tarebia granifera (Lamarck) (trogloxene?). *Citrus County*: Restinghouse Siphon (FGT). REMARKS: This snail is introduced from southeast Asia. This snail was found in association with *Melanoides tuberculatus* on the cave floor between 0-60 meters penetration and at water depths up to 12 meters.

Subclass PULMONATA
Family Endodontidae

Anguispira alternata (Say) (trogloxene). *Jackson County*: caves (Franz et al. 1971).

Family Haplotrematidae

Haplotrema concavum (Say) (trogloxene). *Jackson County*: caves (Franz et al. 1971).

Family Oleacinidae

Euglandina rosea (Ferussac) (trogloxene). *Jackson County*: Gerome's Cave, Kramers cave, Milton's Well Cave, Pottery Cave, River Cave, Vetter's Cave (Franz et al. 1971). *Washington County*: Falling Waters Trail Cave (Franz et al. 1971). REMARKS: Nests with eggs of this snail were reported from several caves in Jackson County (Franz et al. 1971).

Family Polygyridae

Mesodon inflectus (Say) (trogloxene). *Jackson County*: caves (Franz et al. 1971).

Mesodon thyroidus (Say) (trogloxene). *Jackson County*: caves (Franz et al. 1971).

Triodopsis hopetonensis (Shuttleworth) (trogloxene). *Alachua County*: Bat Cave (FGT).

Family Zonitidae

Vintridens demissus (Binney) (trogloxene). *Jackson County*: caves (Franz et al. 1971).

Family Planorbidae

Gyraulus parvus (Say), Ash Gyro (trogloxene?). *Alachua County*: Bat Cave (FGT). REMARKS: The presence of this snail and *Promenetus* in Bat Cave is puzzling. The cave is located in the Newberry Karst Plain and is not close to any standing or flowing bodies of surface water (RF).

Promenetus sp. (trogloxene?). *Alachua County*: Bat Cave (FGT).

Unidentified snails. *Madison County*: Madison Blue Spring (TM).

Phylum ARTHROPODA
Class CRUSTACEA
Subclass OSTRACODA

Family Entocytheridae

Uncinocythere ambophora (Walton and Hobbs) (commensal on troglobites). *Putnam County*: on *Procambarus morrisi* at Devil's Sink (Hobbs and Franz 1990). *Seminole County*: on *Procambarus acherontis* at Palm Springs (Walton and Hobbs 1959).

Uncinocythere equicurva (Hoff) (trogloxene?). Reported by Hoff (1944) on *Procambarus lucifugus alachua* (specific data not mentioned); also known on surface crayfishes (Hoff 1944); identity questioned by Walton and Hobbs (1959).

Uncinocythere lucifuga (Walton and Hobbs) (commensal on troglobites). *Alachua County*: on *Procambarus lucifugus alachua* from Hog Sink; on *Procambarus pallidus* from Squirrel Chimney (Walton and Hobbs 1959). *Marion County*: on *Procambarus franzi* from Orange Lake Cave (A. Norden, personal communication, Maryland Natural History Society, Baltimore).

Uncinocythere warreni Hobbs and Walton (commensal on troglobites). *Decatur County, Georgia*: on *Cambarus cryptodytes* from Climax Cave (Hobbs and Walton 1968). REMARKS: This ostracod also should occur on *Cambarus cryptodytes* in caves of Jackson County, Florida.

Other Ostracods. REMARKS: Lee (1969*a*:175) reported "Six species of ostracods of the families Canoninae and Cypridacea... including one specimen identified to the genus *Darwinula*" from the gut of *Haideotriton wallacei* from Gerards Cave in Jackson County.

Subclass EUCOPEPODA

Unidentified copepods. Lee (1969*a*) reported finding copepods in the gut of *Haideotriton wallacei* from Gerards Cave. Hobbs (1942*b*)

also mentioned copepods from Gum Cave. Other copepod records include *Columbia County*: Jug Spring (TM); *Gilchrist County*: Devil's Eye and Ear Spring (TM). *Leon County*: Little Dismal Sink (TM). *Levy County*: Gunpowder Sink (TM). *Marion County*: Silver Springs (TM); *Suwannee County*: Charles Spring (TM), Irvine Slough Spring (TM). REMARKS: Copepods frequently were found in association with catfish feces (TM).

Subclass MALACOSTRACA
Order ISOPODA
Family Trichoniscidae

Miktoniscus alabamensis Muchmore (troglophile). *Jackson County*: Florida Caverns, Miller's Cave (Vandel 1965*a*, 1965*b*; Peck 1970).

Order AMPHIPODA
Family Crangonyctidae

Crangonyx floridanus Bousfield (troglophile). *Dade County*: well at Little Bird Nusery and Garden Store in Miami (JRH). *Jackson County*: China Cave (JRH), Gerard's Cave (Lee 1969*a*), Geromes Cave (JRH), Judges Cave (JRH), Millers Cave (JRH), Pool Cave (JRH). *Suwannee County*: Azure Blue Sink (JRH). REMARKS: The type series of this amphipod was collected in a swamp at Highlands Hammock State Park, Florida (Bousfield 1963). It also has been taken from a swamp in St. Tammany Parish, Louisiana (Holsinger 1972). Specimens from the well in Miami do not differ from those in northern Florida and do not represent an undescribed subspecies as suggested earlier by Holsinger (1972; personal communication, Old Dominion University).

Family Talitridae

Hyallela azteca (Saussure) (trogloxene). *Holmes County*: Vortex Blue Spring (Helfman 1986). REMARKS: Reported as part of the benthos from the cave tunnel and from the shallower cavern region at Vortex Spring.

Order DECAPODA
Family Cambaridae

Procambarus alleni (Faxon) (trogloxene). *Monroe County*: shallow solution channels on Big Pine Key (DSL).

Procambarus paeninsulanus (Faxon) (trogloxene). *Jackson County*: Gerome's Cave (DSL). REMARKS: This crayfish was abundant in the

main cave pool at Geromes Cave; ovigerous females were found in burrows constructed in bat guano along its bank (DSL).

Procambarus fallax (Hagen) (trogloxene). Alachua County: Alachua Sink (Hobbs et al. 1977).

Family Palaemonidae

Marcobrachium carinus (L.) (accidental?). *Marion County*: Silver Glen Spring (Hobbs and Franz 1992), Silver Springs (Tom Allen, personal communication, formerly Gainesville, Florida). REMARKS: This shrimp has been encountered in the entrances of spring caves in the lower St. Johns River system. Prior to the building of Rodman Dam, the species once was common in Silver Springs; it apparently has been extirpated from this site (Tom Allen, personal communication). Specimens have been retrieved from the stream below the dam as recently as 1990.

Palaemonetes paludosa (Gibbes) (accidental?). *Columbia County*: Siphon Creek Cave (TM). *Gilchrist County*: Devils Eye and Ear Spring (TM). *Hernando County*: Die Polder 3 (PH), Eagles Nest (TM). *Leon County*: Gopher Sink (Hobbs and Means 1972). *Wakulla County*: Sally Ward Spring (TM), Wakulla Springs (TM). REMARKS: Specimens have been seen at water depths near 60 m in Die Polders 3 (TM). An unusual specimen of *Palaemonetes* was collected in Silver Springs that warrants additional study (HHH). This specimen may represent an undescribed taxon.

Palaemonetes kadiakensis Rathbun (accidental?). Leon County: Bird Sink (USNM). REMARKS: Two females were collected in the dark zone, 60 m inside the cave in September 1993 (B. Pruitt, pers. comm.).

Family Portunidae

Callinectes sapidus Rathbun (accidental?). *Marion County*: Salt Springs (RF), Silver Glen Springs (Hobbs and Franz 1992). REMARKS: Female blue crabs commonly invade the mouths of springs around Lake George on the St. Johns River during their annual migrations.

Other Crustaceans. An unstudied crab (trogloxene?) was collected in the cave at Silver Glen Springs, Marion County (HHH).

Class INSECTA

Order COLLEMBOLA

Family Isotomidae

Isotoma notabilus Schaffer (troglophile). *Alachua County*: Warren Cave (Peck 1970).

Family Tomoceridae

Tomocerus dubius Christiansen (troglophile). *Alachua County*: Warren Cave (Peck 1970). *Jackson County*: Miller's Cave (Peck 1970).

Order ORTHOPTERA
Family Gryllacrididae

Ceuthophilus gracilipes (Haldeman) (trogloxene). *Jackson County*: Bat Cave, Blue Spring Cave, Florida Caverns, Gerard's Cave, Miller's Cave, small cave near Judges Cave (Hubbell 1936, Peck 1970).

Ceuthophilus latibuli Scudder (trogloxene). *Alachua County*: Bat Cave, Dudley Cave, Grant's Cave, Jook Cave, O'Steen's Cave, Warren Cave (Hubbell 1936, Peck 1970). *Citrus County*: Blowing Hole Cave, Dr. Doans (Dames) Cave (Hubbell 1936, Peck 1970). *Marion County*: Belleview Cave, Jennings Cave, Waldo Cave (Hubbell 1936, Peck 1970).

Ceuthophilus virgatipes Rehn & Hebard (trogloxene). *Alachua County*: Dudley Cave (Hubbell 1936, Peck 1970). *Marion County*: Villa Height's Cave (Hubbell 1936, Peck 1970).

Order COLEOPTERA
Family Leiodidae

Nemadus sp. (troglophile). *Alachua County*: Warren Cave (Peck 1970). *Jackson County*: Gerard's Cave (Peck 1970).

Prionchaeta opaca (Say) (troglophile). *Jackson County*: Gerard's Cave, Miller's Cave (Peck 1970).

Ptomaphagus cavernicola Schwarz (troglophile). *Alachua County*: Warren Cave (Peck 1970). *Jackson County*: Gerard's Cave (Lee 1969*a*). REMARKS: Lee (1969*a*) found this beetle in the stomaches of *Haideotriton wallacei* from Gerard's Cave. Although it is found regularly in caves from Mexico to Florida, this beetle recently was recorded away from caves in mixed pine and deciduous forests of floodplain loam or sandy soils in Jackson, Leon, and Suwannee counties, Florida, and in Macon County, Georgia (Peck 1982). Peck (1982) concluded that *P. cavernicola* is a contemporary inhabitant of forests of the southeastern United States, is not cave-limited or a Recent climatic relict, and probably can colonize suitable cave sites.

Family Dytiscidae

Hydroporus clypealis Sharp (accidental?). *Alachua County*: Devil's Hole (Hobbs 1942*b*, Young 1942).

Family Staphylinidae

Atheta (*Atheta*) *annexa* Casey (trogloxene). *Jackson County*: Miller's Cave (Klimaszewski and Peck 1986).

Atheta (*Dimetrota*) *lucifuga* Klimaszewski and Peck (trogloxene). *Jackson County*: Miller's Cave (Klimaszewski and Peck 1986).

Atheta (*Dimetrota*) *troglophila* Klimaszewski and Peck (troglophile). *Jackson County*: Miller's Cave (Klimaszewski and Peck 1986).

Family Catopidae

Unidentified catopid beetle. Lee (1969*a*) reported these beetles in the gut of *Haideotriton wallacei* from Gerards Cave.

Family Carabidae

Rhadine larvalis LeConte (troglophile). *Jackson County*: "from at least one Marianna area cave" (T. C. Barr, Jr., personal communication, University of Kentucky). REMARKS: This beetle also was found in Turk's Cave, near Evergreen, Conecuh County, Alabama, and could occur in any Florida cave (T. C. Barr, Jr., personal communication).

Order DIPTERA

Family Nycteribiidae

Basilia boardmanii Rozeboom (trogloxene). *Marion County*: on *Myotis austroriparious* from Orange Lake Cave. (James Bain, personal communication, Flagstaff, Arizona).

Family Streblidae

Trichobius major Coquillet (trogloxene). *Citrus County*: Sweet Gum Cave (Hubbard 1901). *Marion County*: on *Myotis austroriparious* from Orange Lake Cave (James Bain, personal communication).

Class ARACHNIDA

Order UROPYGI

Family Thelyphonidae

Mastigoproctus giganteus (accidental). *Citrus County*: Sweet Gum Cave (Hobbs 1942*b*). REMARKS: Listed as *Thelyphonus giganteus* by Hobbs (1942*b*).

Order OPILIONES

Family Phalangodidae

Phalangodes (*Bishopella*) *laciniosa* Crosby & Bishop (troglophile). *Jackson County*: Florida Caverns (listed as *P. marianna* by Goodnight and Goodnight 1942, 1953).

Phalangodes (*Crosbyella*) *spinturnix* Crosby and Bishop (troglophile). *Jackson County*: Gerard's Cave, Milton Cave, Miller's Cave (Peck 1970).

Order ARANEAE

Family Argiopidae

Azilla affinis (Simon) (troglophile). *Jackson County*: "Spring Cave" and "Two Entrance Cave" in Florida Caverns State Park (Peck 1970). REMARKS: Listed by Peck (1970) as *Azilla vagepicta* Simon. Levi (1980) suggested the use of *A. affinis* instead of *A. vagepicta*.

Family Linyphiidae

Centromerus latidens (Emerton) (troglophile). *Jackson County*: (Old) Indian Cave (Peck 1970). REMARKS: An undetermined female *Centromerus* also was collected in Dr. Dames Cave, Citrus County (Peck 1970).

Family Nesticidae

Gaucelmus augustinus Keyserling (troglophile). *Alachua County*: Bat Cave, Dudley Cave, Squirrel Chimney, Warren Cave (Peck 1970, Gertsch 1984). *Citrus County*: "caves," small cave 8 km (5 mi) north of Dr. Dames Cave, Dr. Dames Cave (Peck 1970, Gertsch 1984)). *Jackson County*: Florida Caverns, Milton's Cave, (Waddells) Mill Pond Cave, Miller's Cave (Peck 1970, Gertsch 1984). *Marion County*: Mefford Cave (Gertsch 1984, Peck 1970)

Eidmannella pallida (Emerton) (troglophile). *Alachua County*: Bat Cave, Grant's Cave, Dudley Cave (Peck 1970, Gertsch 1984). *Citrus County*: Blowing Hole Cave, Dr. Dames Cave (Peck 1970, Gertsch 1984). *Jackson County*: cave near Gerards Cave, Florida Caverns, Gerard's Cave, Judges Cave, Miller's Cave, (Miltons) Well Cave No.1, (Waddells) Mill Pond Cave, Old Indian Cave (Peck 1970, Gertsch 1984) REMARKS: New name combination was suggested by Gertsch (1984). Formerly called *Nesticus pallidus*.

Family Cteniidae

Ctenus captiosus (troglophile?). Probably in Florida caves (Edwards 1989).

Order ACARI

Unidentified mites. Lee (1969*a*) reported a single mite in the gut of a *Haideotriton wallacei* from Gerard's Cave.

Class DIPLOPODA

Family Cambalidae

Cambala annulata (Say) (troglophile). *Jackson County*: Gerard's Cave, Indian Cave, Judges Cave, Miller's Cave, Milton's Cave (Peck 1970).

Class CHILOPODA

Family Lithiobiidae

Lithobius atkinsoni Bollman (troglophile). *Jackson County*: Gerard's Cave, Milton's Cave (Peck 1970).

Other Invertebrates. P. Heinerth (personal communication) found sponges on divers' guide lines that extended into Black Hole, Pasco County. This cave lies in a tidal marsh near the Gulf of Mexico. The water in the sink is usually heavily stained by tannins, which accounts for the cave's name. In addition, colonies of freshwater colonial cnidarians, *Cordylophora lacustris*, and several types of zooplankton were reported from Little River Spring Cave in Suwannee County (Streever 1993).

Phylum CHORDATA

Class OSTEICHTHYES

Family Anguillidae

Anguilla rostrata (Lesueur), American Eel (trogloxene). *Holmes County*: Vortex Blue Spring (Helfman 1986). *Jackson County*: Gerard's Cave (Pylka and Warren 1958, DSL), Hole-in-the-Wall (TM), Jackson Blue Spring (TM), Milton's Well Cave (DSL), Twin Cave (PS, TM). *Leon County*: Bird Sink (TM), Gopher Sink (Hobbs and Means 1972), Little Dismal (TM), Munson Slough Blue (TM), Sullivan's Sink (TM). *Madison County*: Thunderhole (TM). *Marion County*: Silver Glen Spring (Hobbs and Franz 1992). *Suwannee County*: Bonnett Spring (TM), Charles Spring (TM). *Wakulla County*: Wakulla Springs (TM).

Family Aphredoderidae

Aphredoderus sayanus (Gilliams), Pirate Perch (trogloxene). *Jackson County*: Ellis Cave (Brockman and Bortone 1977). *Suwannee County*: Irvine Slough Spring (TM), Orange Grove Sink (TM), Peacock Springs (TM). REMARKS: This fish has been seen up 200 m inside the cave at Peacock Springs and 16 m inside Irvine Slough Cave (TM).

Family Poeciliidae

Gambusia holbrooki Girard, Mosquitofish (trogloxene?). *Alachua County*: Twin Chimneys Sink (Marshall 1947). *Jackson County*: Pool Cave (DSL). *Leon County*: Gopher Sink (Hobbs and Means 1972). *Levy County*: Half-Moon Cave (Marshall 1947). REMARKS: Recent name change from *Gambusia affinis holbrooki.*

Family Moronidae

Morone saxitilus (Walbaum), Striped Bass (accidental). *Marion County*: Silver Glen Spring (Hobbs and Franz 1992). REMARKS: Specimens of this fish followed divers into the cave system at Silver Glen Springs (Hobbs and Franz 1992).

Family Cyrinidae

Notropis harperi Fowler, Redeye Chub (trogloxene). *Alachua County*: Bat Cave (Relyea and Sutton 1973*b*), Cow Sink (Marshall 1947), Fern Cave (TM), Hog Sink (Hobbs 1942*b*, Marshall 1947), Jerome Sink (Marshall 1947), Martin's Cave (Relyea and Sutton 1973*b*), Squirrel Chimney (TM), Zamia Sink (Marshall 1947). *Citrus County*: unidentified caves in Withlacoochee State Forest (DSL). *Gilchrist County*: Devil's Eye and Ear Spring (TM), Hart Spring (TM), Little Devil's Spring (TM), Otter Springs (TM). *Holmes County*: Vortex Spring (TM). *Jackson County*: Jackson Blue Spring (TM), Twin Cave (TM). *Leon County*: Gopher Sink (Hobbs and Means 1972), Half-Moon Cave (Marshall 1947), Pool Cave (O. G. Brock, personal communication, Florida Park Service). *Levy County*: Gunpowder Sink (TM). *Madison County*: Baseline Cave (TM), Thunderhole (TM). *Marion County*: Silver Glen Spring (Hobbs and Franz 1992). *Suwannee County*: Bonnett Spring (TM), Irvine Slough Cave (TM), Peacock Springs (TM), Wingate Well (TM). *Wakulla County*: Wakulla Springs (TM). *Washington County*: Econfina Blue Spring Cave (RF).

Family Ictaluridae

Ameiurus natalis (Lesueur), Yellow Bullhead (trogloxene). *Alachua County*: Bat Cave (RF, Relyea and Sutton 1973*b*), Chimney Sink (USNM), Crumbly Sink (TM), Hornsby Spring (TM), Martin Cave (Relyea and Sutton 1973*b*), Still Sink (Cooper 1965*b*). *Columbia County*: Jug Spring on Ichetucknee River (RF), Rose Creek Swallet and Overflow (TM). *Gilchrist County*: Devil's Eye and Ear Spring (TM), Hart Spring (TM), Otter Spring (TM), Siphon Creek Cave (TM), Rock Bluff Spring (TM). *Hamilton County*: Firecracker Cave (Pruitt 1991*d*, 1992), Pott Spring (TM), Rossiter Spring (TM), White Springs (all dead, TM). *Hernando*

County: Die Polder 3 (TM). Holmes County: Vortex Spring (TM). *Jackson County*: Hole in Wall (TM), Jackson Blue Spring (TM), Twin Cave (PS). *Lafayette County*: Alligator Rescue Spring (TM), Allens Mill Pond Spring (TM), Lafayette Blue Spring (Pruitt 1992), Perry Spring (TM). *Leon County*: Bird Sink Swallett (TM), Gopher Sink (TM), Munson Slough Blue (TM). *Levy County*: Manatee Springs (TM), Octopus Cave (Pruitt 1991*a*). *Madison County*: M2 Blue Cave (Pruitt 1991*d*, 1992). Thunderhole Sink (PH). *Suwannee County*: Anderson Spring (TM), Azure Blue (TM), Bonnett Springs (TM), Irvine Slough (TM), Peacock Springs (TM), Stick Sink (TM), Water Hole Cave (TM). *Wakulla County*: McBride Slough (TM), Wakulla Springs (TM). REMARKS. *Procambarus pallidus* was found in the stomach of a Chimney Sink catfish (notes associated with USNM crayfish specimen); *Procambarus lucifugus* in the stomach of Bat Cave catfish (Relyea and Sutton 1973*b*). Pruitt (1992) noted over a hundred individuals of this fish in Firecracker Cave in July.

Ameiurus nebulosus (Lesueur) Brown Bullhead (trogloxene?). *Hamilton County*: Firecracker Cave (Pruitt 1991*c*, 1992). *Holmes County*: Vortex Spring (TM).

Family Centrachidae

Lepomis macrochirus Rafinesque, Blue Gill (trogloxene). *Jackson County*: cave in Florida Caverns State Park (DSL), cave near dump south of Marianna (DSL).

Pomoxis nigromaculatus (Lesueur), Black Crappie (accidental). *Suwannee County*: Peacock III Spring (TM).

Class AMPHIBIA

Order CAUDATA

Family Ambystomatidae

Ambystoma opacum (Gravenhurst), Marbled Salamander (accidental). *Jackson County*: unidentified cave on Milton property (DSL).

Ambystoma tigrinum tigrinum (Green), Eastern Tiger Salamander (accidental). *Jackson County*: Milton's Well Cave (DSL).

Family Plethodontidae

Eurycea cirrigera (Green), Southern Two-lined Salamander (accidental). *Jackson County*: Ellis Cave (DSL).

Eurycea longicauda guttolineata (Holbrook), Three-lined Salamander (troglophile). *Jackson County*: Ellis Cave (DSL), Gerome's Cave (DSL), Miller's Cave (RF), Milton's Well Cave (DSL), Pottery

Cave (RF), Gerard's Cave (Lee 1969*c*). REMARKS: Larvae, transformed juveniles, and adults were present in several caves.

Plethodon grobmani Neill (trogloxene). *Jackson County*: Ellis Cave (DSL), Miller's Cave (RF), Milton's Well Cave (DSL), Pottery Cave (RF).

Order ANURA

Family Leptodactylidae

Eleutherodactylus planirostris planirostris (Cope), Greenhouse Frog (trogloxene). *Alachua County*: Bat Cave (RF). *Citrus County*: Sweet Gum Cave (RF). *Levy County*: Octopus Cave (Pruitt 1991*a*). *Marion County*: Orange Lake Cave (RF, DSL).

Family Bufonidae

Bufo terrestris Bonnaterre, Southern Toad (trogloxene). *Jackson County*: Milton's Well Cave (DSL).

Family Pelobatidae

Scaphiopus holbrooki holbrooki (Harlan), Eastern Spadefoot (accidental). *Alachua County*: Warren Cave (RF).

Family Hylidae

Acris gryllus dorsalis (Harlan), Florida Cricket Frog (accidental). *Jackson County*: Milton's Well Cave (DSL).

Pseudacris crucifer crucifer Weid, Northern Spring Peeper (accidental). *Jackson County*: Milton's Well Cave (DSL).

Hyla gratiosa Leconte, Barking Tree Frog (accidental). *Jackson County*: Milton's Well Cave (DSL), Miller's Cave (RF).

Hyla squirella Sonnini and Latreille, Squirrel Treefrog (accidental). *Jackson County*: Milton's Well Cave (DSL).

Family Ranidae

Rana catesbeiana Shaw, Bullfrog (accidental?). *Alachua County*: Bat Cave (RF), Goat Sink (Lee 1969*c*). *Jackson County*: Gerome's Cave (DSL), Ellis Cave (RF), Gerard's Cave (Lee 1969*c*). *Suwannee County*: Sim's Sink (RF). REMARKS: Large female bullfrog (173 mm SVL) from Gerome's Cave contained an unidentified bat in its stomach (DSL).

Rana clamitans Latreille, Bronze Frog (accidental). *Jackson County*: Milton's Well Cave (DSL).

Rana grylio, Pig Frog (accidental). *Levy County*: Octopus Cave (Pruitt 1991*a*).

Rana utricularia Cope, Southern Leopard Frog (accidental?). *Alachua County*: Bat Cave (RF), Warren Cave (Hobbs 1942*b*). *Columbia County*: Riverbed Cave (Hobbs 1942*b*). *Jackson County*: Gerard's Cave (Lee 1969*c*), Waddell's Mill Spring Cave (DSL). *Levy County*: Octopus Cave (Pruitt 1991*a*). *Marion County*: Orange Lake Cave (RF, DSL), Sunday Sink (RF).

Class REPTILIA
Order CROCODYLIA
Family Alligatoridae

Alligator mississipiensis (Daudin), American Alligator (accidental). *Jackson County*: Small cave along the Chipola River floodplain (RF). *Lafayette County*: Alligator Rescue Spring (TM). *Levy County*: Maddox Cave (BP, BH, AK). REMARKS: A small alligator (approx. 1 m in length) was wedged into the passage of a small cave at the base of a limestone bluff along the floodplain of the Chipola River. A 2-m individual repeatedly was found in Maddox Cave about 15 m inside the entrance. The Lafayette animal was rescued from the bottom of a collapse sink where it had apparently fallen and became entrapped. Other alligators are reported from caves in the vicinity of Sawgrass Lake, southeast of Archer, Levy County, Florida (A. Krause, personal communication).

Order TESTUDINES
Family Chelydridae

Chelydra serpentina osceola Stejneger, Florida Snapping Turtle (accidental). *Marion County*: Nickelberger Cave (PS).

Family Emydidae

Pseudemys floridana peninsularis Carr, Peninsula Cooter (accidental). *Citrus County*: Hall's Bat Cave (DSL). REMARKS: Unidentified *Pseudemys* also are reported from Octopus Cave, Levy County (Pruitt 1991*a*).

Order SQUAMATA
Suborder LACERTIDAE
Family Anguidae

Ophisaurus ventralis (Linnaeus), Eastern Glass Lizard (accidental). *Jackson County*: Milton's Well Cave (RF).

Suborder SERPENTES
Family Colubridae

Nerodia fasciata fasciata (Linnaeus), Banded Watersnake (accidental). *Jackson County*: Pool Cave (RF).

Elaphe guttata guttata (Linnaeus), Corn Snake (trogloxene). Listed only as Florida caves by Pylka (1957).

Elaphe obsoleta quadrivittata (Holbrook), Yellow Ratsnake (trogloxene). *Alachua County*: Bat Cave (RF). *Citrus County*: Sweet Gum Cave (Hobbs 1942*b*, RF).

Elaphe obsoleta spiloides (Dumeril, Bibron, Dumeril), Gray Ratsnake (trogloxene). *Jackson County*: Geromes Cave (RF, DSL), Gerard's Cave (Lee 1969*c*).

Family Viperidae

Agkistrodon piscivorous conanti Gloyd, Florida Cottonmouth (accidental?). *Jackson County*: Ellis Cave (DSL), Judges Cave (DSL).

Crotalus adamanteus Beauvois, Eastern Diamondback Rattlesnake (accidental). *Alachua County*: Squirrel Chimney (Franz 1968).

Class AVES

Family Strigidae

Strix varia alleni Ridgway, Barred Owl (accidental?). *Levy County*: Octopus Cave (Pruitt 1991*a*).

Family Cathartidae

Coragyps atratus (Bechstein), Black Vulture (accidental?, nesting in cave). *Jackson County*: Unnamed cave on Merritt's Mill Pond. REMARKS: Adult and two young were found 7 m inside the cave entrance (TM).

Class MAMMALIA

Family Didelphidae

Didelphus virginana pigra Bangs, Virginia Opossum (accidental). Listed only as Florida caves by Pylka (1957).

Family Soricidae

Blarina carolinensis carolinensis (Bachman), Short-tailed Shrew (accidental). *Levy County*: Octopus Cave (Pruitt 1991*a*).

Family Molossidae

Tadarida brasiliensis cynocephala (LeConte), Freetail Bat (accidental). *Marion County*: "several caves" (Morgan 1985). REMARKS: Record based on single observations at Orange Lake Cave and Sunday Sink in September 1974 and 1975, respectively. In each case, single bats (males?) were found on the walls at night near the cave entrances. The bats immediately took flight and left the cave when they were disturbed (RF field notes).

Family Vespertilionidae

Pipistrellis subflavus floridanus Davis, Least Bat (trogloxene). *Alachua County*: Goat Sink (RF). *Gilchrist County*: Roberts Cave (RF). *Levy County*: Octopus Cave (Pruitt 1991*a*). *Jackson County*: Gerome's Cave (DSL), Miller's Cave (Brock, personal communication), Old Indian Cave (Rice 1955*a*, 1955*b*, Jennings and Layne 1957), Gerard's Cave (Lee 1969*c*). *Marion County*: Orange Lake Cave (RF), Sunday Sink (RF).

Myotis austroriparious (Rhoads), Southeastern Bat (trogloxene). *Alachua County*: Bat Cave (RF), Grant's Cave (RF, Rice 1957), Hog Sink (Rice 1957), Jones Cave (McNab 1974), Seven Chimneys Sink (McNab 1974), Warren Cave (McNab 1974). *Citrus County*: Sweet Gum Cave (RF). *Gilchrist County*: Roberts Cave (RF, Rice 1957). *Jackson County*: Gerard's Cave (DSL), Old Indian Cave (Jennings and Layne 1957), Mud Cave (Rice 1955*b*). *Levy County*: Devil's Den (Pruitt 1991*b*), Octopus Cave (Pruitt 1991*a*). *Marion County*: Hell Hole (BH), Orange Lake Cave (RF), Sunday Sink (RF). *Suwannee County*: Devil's Head and Horns, Mulky Road Sink (RF). (Also see Humphrey and Gore 1992). REMARKS: This bat is proposed a candidate for federal listing (Wood 1993)

Myotis grisescens Howell, Gray Bat (trogloxene). *Jackson County*: Gerome's Cave (DSL), Gerard's Cave (DSL), Milton's Cave (DSL), Old Indian Cave (Rice 1955*b*, Jennings and Layne 1957, Lee and Tuttle 1970, Humphrey and Tuttle 1978), ONS Cave (DSL). REMARKS: The Florida Committee on Rare and Endangered Plants and Animals listed this bat as Endangered (Humphrey and Tuttle 1978; Gore 1992). This bat also is listed by both the State of Florida and by U. S. Fish and Wildlife Service as Endangered (Wood 1993).

Myotis keenii septentrionalis (Trouessart), Keen's Bat (trogloxene). *Jackson County*: Old Indian Cave (Rice 1955*b*, Scudder and Humphrey 1978). REMARKS: Only two specimens of this bat are known from Florida. This bat was considered Endangered in the 1982 Florida Rare and Endangered Biota volume on mammals (Scudder and Humphrey 1978) but not listed in the 1992 revised volume (Humphrey 1992).

Myotis sodalis Miller and Allen, Social Bat (trogloxene). *Jackson County*: Old Indian Cave (Jennings and Layne 1957, Humphrey and Scudder 1978). Only one specimen is known from Florida. The Florida Committee on Rare and Endangered Plants and Animals listed this bat as Endangered (Humphrey and Scudder 1978; Humphrey 1992). This bat also is listed by the State of Florida and the U.S. Fish and Wildlife Service as Endangered (Wood 1993).

Family Castoridae

Castor canadensis carolinensis Rhoads, Beaver (accidental). *Jackson County*: Gerome's Cave (DSL).

Family Sciuridae

Sciurus carolinensis carolinensis Gmelin, Gray Squirrel (accidental). Listed only as Florida caves by Pylka (1957).

Family Cricetidae

Peromyscus gossypinus gossypinus (Leconte), Cotton Mouse (accidental). *Levy County*: Octopus Cave. *Jackson County*: Gerome's Cave (DSL), Gerard's Cave (Lee 1969*c*).

Neotoma floridana floridana (Ord), Eastern Woodrat (trogloxene). *Columbia County*: Bussey's Sink (RF). *Jackson County*: Gerome's Cave (DSL), Old Indian Cave (DSL), Pool Cave (DSL), Waddell's Mill Pond Cave (DSL), Gerard's Cave (Lee 1969*c*). *Marion County*: Sunday Sink (RF). *Suwannee County*: Mulky Road Sink (RF).

Family Procyonidae

Procyon lotor elucus Bangs, Raccoon (accidental?). *Levy County*: Octopus Cave (Pruitt 1991*a*).

SUMMARY—The less specialized members of the Florida and south Georgia cave faunas include: unidentified zooplankton, sponges, one colonial cnidarian, two branchiobdellid annelids, unidentified aeolosomatid oligocheates, two bivalves, five prosobranch and nine pulmonata gastropods, four entocytherid and several other ostracods, unidentified copepods, one isopod, two amphipods, eight decapods (shrimps, crayfishes, and crab), two springtails, three crickets, nine beetles, two parasitic flies, one vinegaroon, two harvestmen, five spiders, unidentified mites, one millipede, one centipede, nine fishes, five salamanders, 11 frogs, one crocodilian, two turtles, one lizard, six snakes, two birds, and 13 mammals. The list consists of 37 accidentals, 47 trogloxenes, 23 troglophiles, and four obligate commensals on troglobite hosts. Of the vertebrates, a few fishes (*Anguilla rostrata, Notropis harperi, Ameiurus natalis*), one salamander (*Eurycea longicauda*), two frogs (*Rana catesbeiana, R. utricularia*, and five bats (*Pipistrellis subflavus, Myotis austroriparius, M. grisescens, M. keeni*, and *M. sodalis*) appear to have more than a casual relationship with Florida caves. *Myotis grisescens, M. keeni*, and *M. sodalis* are the only

bat species recorded from Florida that are dependent on caves; the latter two are reported only rarely and probably are not regular members of Florida and south Georgia's cave faunas.

OBLIGATE CAVE FAUNAS AND KARST REGIONS

The biogeography of Florida and south Georgia's troglobites have been discussed by Hobbs (1958), Caine (1974), Relyea et al. (1976), Hobbs et al. 1977, Means (1977), Franz and Lee (1982), and others. Each new discovery invites interpretative changes. The new distributional records accumulated since 1982 necessitate further comments concerning distributional patterns exhibited by this unique group of species.

Six distinct cave faunas are suggested in the Florida and south Georgia region (Fig. 2). Other unidentified faunas may emerge when limestone areas outside of the geographic ranges of the six are better surveyed. Each of the six faunas occupies a specific geographic range, has precinctive taxa, and is characterized by specific geologic and hydrologic characteristics. The two largest faunas (Ocala, St. Johns) are broken into smaller assemblages (Table 1, Fig. 3). An assemblage is defined as an isolated segment of a fauna that possesses distinctive taxa.

Taxa are listed for each fauna in the accompanying faunal descriptions; taxa associated with a specific assemblage are shown on Table 1. In these faunal descriptions, one asterisk (*) preceding a name indicates a precinctive species; double asterisks (**) identify taxa that occur in three or more faunas.

Econfina Creek Fauna

Species List—**Dasyscias franzi*, **Caecidotea* sp.1. The fauna is known from a single cave in the Econfina Creek basin. The karst area associated with the Econfina Creek Fauna is located in southern Washington and northern Bay counties. It remains largely unexplored, although there are numerous spring outlets along the mid-portions of Econfina Creek where elements of the fauna may eventually be found. Additional spring water also emerges from the Floridan aquifer directly into Econfina Creek through fissures in the stream bed and from the base of bluffs at points where the stream breaches overlying terrace deposits (Vernon 1942, Musgrove et al. 1965). Econfina Blue Springs are composed of several spring outlets along the edge of a low bluff that borders a large spring pool on the east side of Econfina Creek. Combined flow rates for these springs ranged from 32-51 cu. ft/sec. (1941-1972) (Rosenau et al. 1977). The springs are developed at the contact between an upper

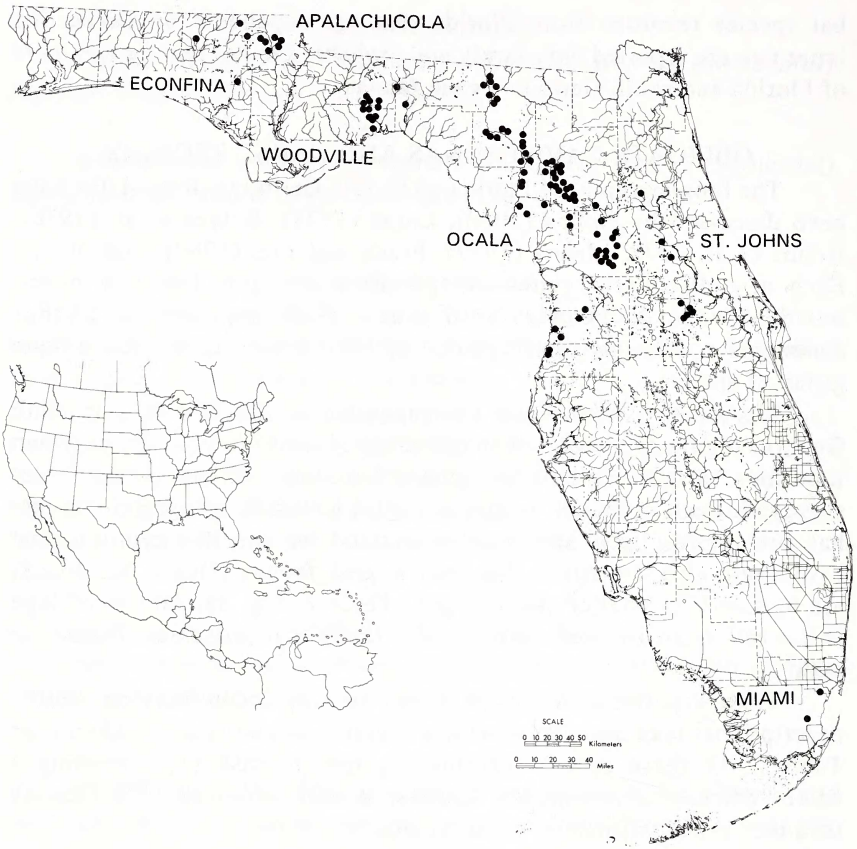

Fig. 2. Distributions of the six regional faunas. Dots indicate the position of biologically significant caves in Florida (see Appendix 1).

shell bed and a fine- to medium-grained dolomitic calcarenite that appears to be related to the Jackson Bluff group of marine sediments, probably Miocene in age (Muriel Hunter, personal communication, Tallahassee, Florida). Cooke (1945) considered the shell layer to represent the "Cancellaria Zone" in the Duplin marl which overlies a "cavernous limestone" in the Shoal River Formation. These spring caves lie close enough to the surface that they are breached by numerous small conical sinks in the adjoining upland. Available samples of the Econfina Creek Fauna were obtained from a small, permanently flowing cave stream at the base of one of these sinkholes behind the most westerly spring outlet.

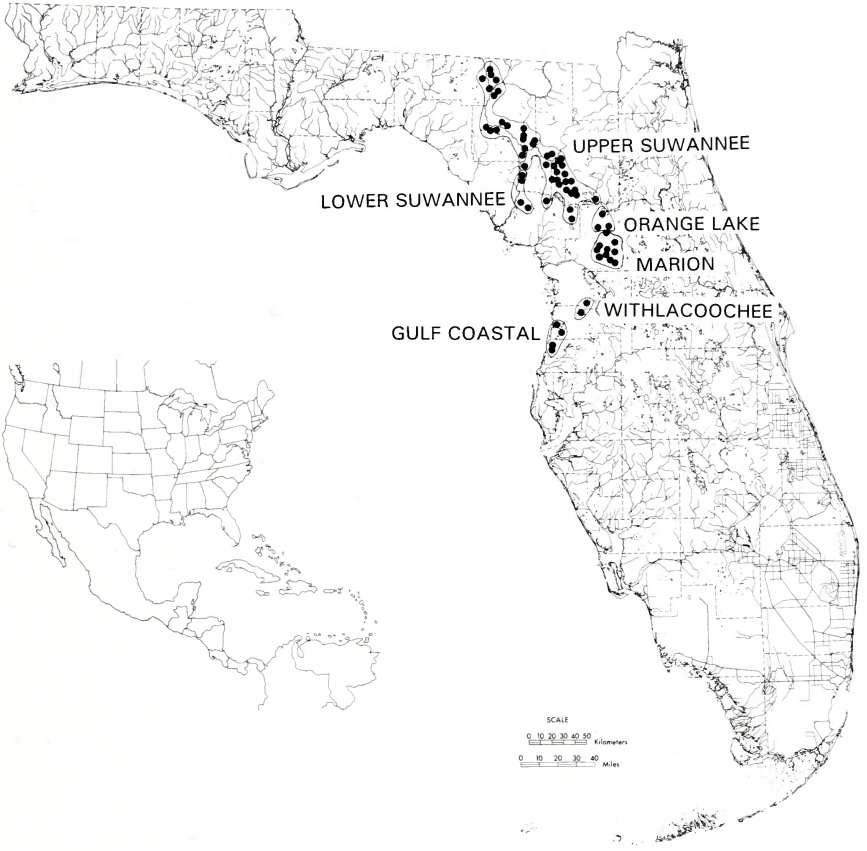

Fig. 3. Distribution of the assemblages associated with the Ocala Fauna.

Apalachicola Fauna.

Species List—***Caecidotea hobbsi*, **Cambarus cryptodytes*, *Pseudosinella pecki*, **Islandiana* sp., **Haideotriton wallacei*. Three of five taxa associated with the Apalachicola Fauna are precinctive. This faunal region contains the only known terrestrial troglobites in the state. The Apalachicola Fauna occurs in two segments, one in the Marianna Lowlands of Jackson County, Florida, and the other in the Dougherty Plain along the Flint River in Decatur and Dougherty counties, Georgia (Fig. 4) (Beck and Arden 1984, Lane 1989). Franz and Lee (1982) suggested that the Marianna species were associated with caves that were developed in the Ocala Group limestones at or near the

Table 1. Species composition of the assemblages associated with the Ocala and St. Johns River cave faunas. Asterisk (*) identifies unique taxa in each assemblage.

OCALA FAUNA

Upper Suwannee Assemblage.
- *Caecidotea hobbsi*
- *Remasellus parvus*
- *Crangonyx grandimanus*
- *Crangonyx hobbsi*
- **Palaemonetes cummingi*
- **Procambarus erythrops*
- **Procambarus lucifugus alachua*
- **Procambarus pallidus*
- *Troglocambarus maclanei*

Lower Suwannee Assemblage
- *Crangonyx grandimanus*
- *Crangonyx hobbsi*
- **Procambarus lucifugus* X *alachua*
- *Troglocambarus maclanei*

Orange Lake Assemblage
- *Crangonyx hobbsi*
- **Procambarus franzi*
- *Troglocambarus maclanei*

Marion Assemblage
- *Caecidotea hobbsi*
- *Crangonyx grandimanus*
- *Crangonyx hobbsi*
- **Procambarus lucifugus* X *alachua*
- *Troglocambarus maclanei*

Withlacoochee Assemblage
- *Crangonyx hobbsi*
- **Procambarus lucifugus lucifugus*
- *Troglocambarus maclanei*

Gulf Coastal Lowlands Assemblage
- *Crangonyx grandimanus*
- *Crangonyx hobbsi*
- **Procambarus leitheuseri*
- *Troglocambarus maclanei*

ST. JOHNS RIVER FAUNA

Wekiwa Assemblage
- **Caecidotea* sp. 2
- **Procambarus acherontis*
- **Troglocambarus* sp.

Lake George Assemblage
- **Procambarus attiguus*
- **Procambarus delicatus*
- **Procambarus morrisi*

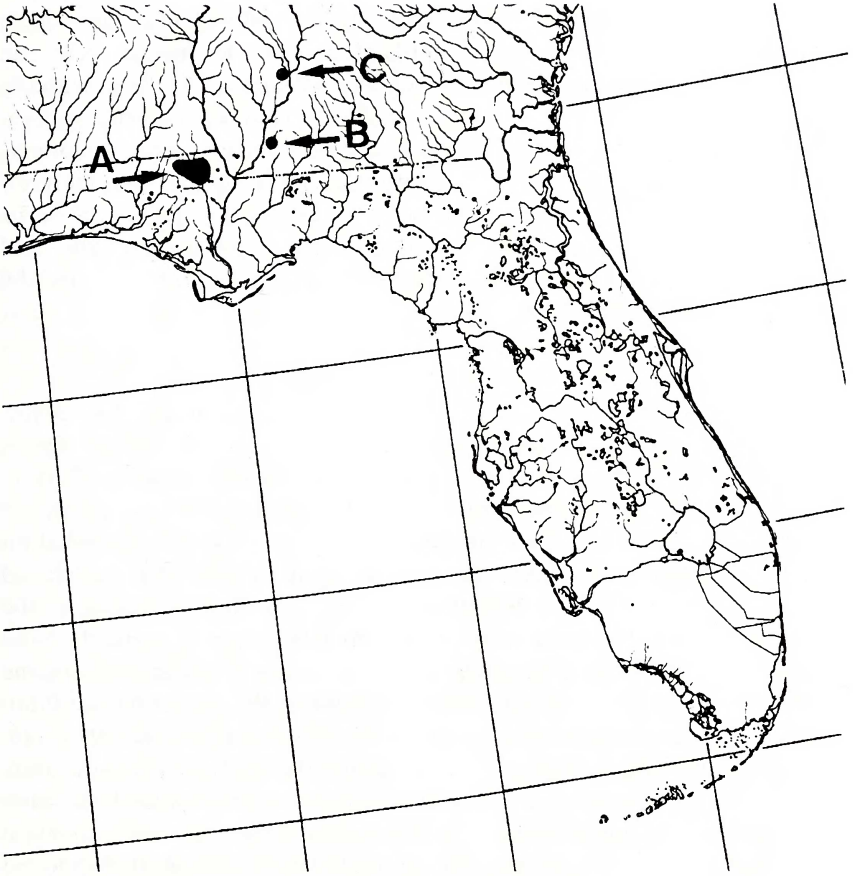

Fig. 4. Caves associated with the (A) Marianna Lowlands and Southwest Georgia segments of the Apalachicola Fauna. Georgia sites—(B) Climax Cave and (C) Albany well.

contact with the younger Suwannee and Marianna limestones (Floridan aquifer). The troglobite records from southwest Georgia were taken from a well at Albany in the heart of the Dougherty Plain and in cave pools at Climax Cave near Climax, Georgia. Climax Cave lies at base of the Pelham Escarpment of the Tipton Upland on the eastern edge of the Dougherty Plain (Beck and Arden 1984). Like caves in the Marianna area, Climax Cave is developed near the contact between the Suwannee Limestone and the Ocala Group limestones (Floridan aquifer) (See Fig. 12b in Beck and Arden 1984).

Means (1977) felt that the two segments were continuous and that the aquatic troglobites could disperse between the two areas wherever

there were solution channels in the limestone large enough to accommodate them. Unfortunately, there are no records of these species from intermediate areas, although Means (1977) noted a cave along the Apalachicola River that should be sampled. No troglobites were located during preliminary surveys of caves in Dothan County, Alabama (John E. Cooper, personal communication, Raleigh, North Carolina). Slight or no morphological differences have been noted between the populations of *Cambarus cryptodytes* and *Haideotriton wallacei* from the two areas (Pylka and Warren 1958, Means 1977, Hobbs 1981), which further supports the continuous population hypothesis.

Woodville Fauna

Species List—*Remasellus parvus*, ***Crangonyx hobbsi*, ***Crangonyx grandimanus*, **Procambarus horsti*, **P. orcinus*.The Woodville Fauna is associated with the Ocala Group limestones (Floridan aquifer) in the eroded portions of the Tallahassee Hills and the Woodville Karst Plain, along and below the Cody Scarp, respectively. It is bounded on the west by the Apalachicola Coastal Lowlands (see Hendry and Sproul 1966). The eastern limits remain to be defined, although none of the fauna is known to occur east of the Aucilla drainage. Hendry and Sproul (1966) and Yon (1966) show a more or less continuous limestone shelf below the Cody Scarp (Woodville Karst Plain) across southern Leon and Jefferson counties. Lane (1986:32) describes this area as a "flat to gently undulating surface of sand that overlies carbonate rock. The carbonates, which lie at shallow depths of 30 feet or less, have undergone extensive solution by groundwater. This plain exhibits karst features that are still evolving, for example: many old, well developed sinkholes that are either permanently or intermittently flooded (Big Dismal Sink), disappearing streams and natural bridges (Natural Bridge), Wakulla Springs, and new sinkholes reported periodically."

The fauna appears to follow the riverine karsts associated with the Wakulla-St. Marks rivers and the Wacissa River. In this way, the endemic crayfishes parallel the distribution of the closely-related *Procambarus pallidus* that tracks the riverine karsts of the upper Suwannee River and its tributaries. *P. orcinus* may be restricted to the Wakulla drainage, whereas *P. horsti* may be more closely-tied to the St. Marks and Wacissa drainages. The ecological relationships between them remain unclear, particularly in lieu of an account that both crayfishes co-exist in the Wakulla Springs Cave System (Morris 1989). More collecting is necessary in caves of the Woodville Karst Plain to determine the actual geographic extent of this fauna and its ecological specializations.

Ocala Fauna

Species List—****Caecidotea hobbsi*, *Remasellus parvus*, ****Crangonyx grandimanus*, ****C. hobbsi*, ***Palaemonetes cummingi*, ***Procambarus erythrops*, ***P. franzi*, ***P. leitheuseri*, ***P. lucifugus lucifugus*, ***P. lucifugus alachua*, ***P. lucifugus* X *alachua*, ***P. pallidus*, ***Troglocambarus maclanei*. The Ocala Fauna occurs in mature and riverine karst areas associated with Ocala Group limestones (Floridan aquifer), from the Suwannee River drainage, southwest through Alachua, Marion, Levy, Citrus, Hernando, Pasco, and possibly Pinellas counties. Within this region, the fauna appears fragmented into a series of six geographically distinct assemblages, each characterized by endemic taxa (Table 1). The factor that consolidates the Ocala Fauna is the presence of the crayfishes *Procambarus lucifugus* (and allied species) and *Troglocambarus maclanei* which are represented in every Ocala assemblage.

The Upper Suwannee appears to be the most distinctive of the six assemblages. The Upper Suwannee incorporates the riverine karsts along the upper Suwannee, (northern) Withlacoochee, and lower Santa Fe rivers. It also spills over through the High Springs Gap onto the Western Valley (=Newberry Karst Plain) between the Cody Scarp and the (northern) Brooksville Ridge in western Alachua and northeastern Levy counties (see Fig. 4 and discussions by White 1970, Hoenstine and Lane 1991). In the Western Valley, the assemblage tracks what appears to be an ancient stream channel that may have been a former surface tributary of the Santa Fe River. The Lower Suwannee Assemblage is centered in a small karst area between the town of Bell in Gilchrist County and the Chiefland-Manatee Springs area in Levy County, west of Bell Ridge and the Waccasassa Flats. The Upper and Lower Suwannee assemblages are each distinctive: *Palaemonetes cummingi*, *Procambarus lucifugus alachua*, and *P. pallidus* in the Upper Suwannee; *Procambarus lucifugus* X *alachua*, in the Lower Suwannee. The Upper Suwannee includes populations of the isopod *Remasellus parvus* that also occurs in the Wakulla area south of Tallahassee, but yet unrecorded from the Lower Suwannee. The Upper Suwannee Assemblage (notably *Procambarus pallidus*) ranges down the Suwannee River as far south as Rock Bluff Spring, but apparently does not occur in the Bell karst. For unknown reasons there are no troglobites known from limestone areas on the other bank of the Suwannee River in Dixie County. Barriers to dispersal, if any exist, that separate the Upper and Lower Suwannee assemblages have not been identified.

The Orange Lake and Marion assemblages lie in karsts of Marion County. The Orange Lake Assemblage, which includes the endemic

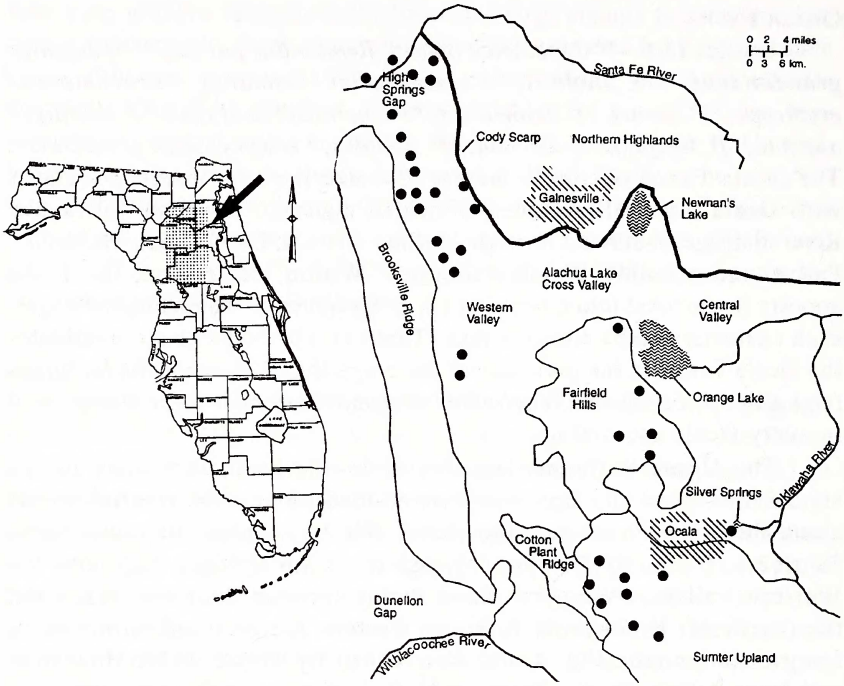

Fig. 5. Map showing important physiographic units that might influence the distributions of species of the Upper Suwannee, Orange Lake, and Marion assemblages in Alachua and Marion counties.

Procambarus franzi, is associated with the eastern Fairfield Hills, south of Orange Lake, whereas the Marion Assemblage occurs in a southern extension of the Western Valley, the Sumter Upland, and the Oklawaha portion of the Central Valley (at Silver Springs) (Fig. 5). Like the Lower Suwannee, the Marion Assemblage includes an intergrade population of *Procambarus lucifugus*.

Hydrologically, the Orange Lake and Marion assemblages fall within the Oklawaha River Drainage Basin as defined by Faulkner (1973) and Lane and Hoenstine (1991). The Fairfield Hills area represents the extreme northwestern corner of the Silver Springs Drainage Area, which has its outlet at Silver Springs on the Oklawaha River in the Central Valley. The Marion Assemblage occurs both in the Silver Springs Drainage Area (at Silver Springs on the Oklawaha River) and the Rainbow Springs Drainage Area with its primary outlet through Rainbow Springs on the (southern) Withlacoochee River (Lane and Hoenstine 1991).

The Withlacoochee Assemblage definitely is known from only one locality (Sweet Gum Cave) on the east slope of the (southern) Brooksville Ridge. A second record (cave 23.3 km north of Weekiwachee) was listed in Hobbs (1942*b*) from Hernando County, but its specific location remains unknown. The unique *Procambarus lucifugus lucifugus* is reported from both sites. The directions listed with the Hernando specimens, if taken literally, places the locality near the Citrus-Hernando county line, probably near Chassahowitzka in Citrus County, on the west side of the (southern) Brooksville Ridge. This area has low relief, and any cave would be flooded and would likely function as a spring, such as the Chassahowitzka Springs group near the town with the same name (see Rosenau et al. 1977). However, if the collector's directions were slightly off and the cave was actually northeast of Weekiwachee, then the locality would fall on the eastern side of the Brooksville Ridge, within 6 km of Sweet Gum Cave. More effort is needed to locate appropriate caves along the (southern) Brooksville Ridge, particularly in the vicinity of the Citrus-Hernando county line, to resolve the Withlacoochee Assemblage's actual geographic extent.

The final assemblage occurs in the Gulf Coastal Lowlands in southwestern Hernando and northwestern Pasco counties. The area lies on the west side of the (southern) Brooksville Ridge, between the towns of Weekiwachee and Hudson. A sighting of a small *Troglocambarus*-like crayfish in Knights Sink at Lake Tarpon suggests that this assemblage's geographic range actually might extend as far south as northern Pinellas County. It includes the unique *Procambarus leitheuseri*. All of the known localities occur in a small coastal limestone strip subdued in part by marine terrace deposits, between the 0.6-m (2 ft) and 9.1-m (30 ft) contour lines (Wetterhall 1965). Troglobites in this assemblage have been recovered from several deep sinks and springs associated with the ridge terrace (Die Polders) and from a spring (Black Hole) in a coastal salt marsh.

St. Johns River Fauna

Species List—**Caecidotea* sp. 2, **Procambarus acherontis*, **P. attiguus*, **P. delicatus*, **P. morrisi*, **Troglocambarus* sp. The St. Johns River Fauna is still incompletely known, and more new taxa are expected as divers penetrate unexplored karst windows and springs along the St. Johns and lower Oklawaha rivers. There are two related assemblages of troglobites within this fauna, one focusing on a small karst area along the Wekiva River in the Orlando metropolitan area and the other occurring along the west shore of Lake George, Alexander Spring Run, and the lower Oklawaha River. No species have been found in the

30-km stretch between the two areas. All of the known occurrences of this fauna are in flooded caves associated with springs, sinkholes, and wells. These cave systems are developed near the contact between the basal units of the Hawthorne Formation and the underlying Ocala Group limestones (Floridan aquifer) (Hobbs and Franz 1986, 1990, 1992).

The Wekiva Assemblage includes an undescribed isopod (*Caecidotea* sp. 2), *Procambarus acherontis*, and an unstudied population of *Troglocambarus*. It occurs in a small limestone plain that lies along the Wekiva River, and east of the Lake Apopka basin, in western Orange and Seminole counties. Groundwater originates in a sand hill region south of the sinkhole plain. A north-directed branch of this water flows northeast towards the Wekiva valley, but an eastern branch intersects a "bad water zone" in eastern Orange County that contains dissolved solids in excess of 1,800 ppm (Barraclough 1962, Lichtler et al. 1968). The north branch emerges as springs along the south escarpment of the river (Rock, Wekiwa, Palm, Sanlando, Witherington, and Barrel springs). Analysis of water from these springs shows less than 150 ppm of dissolved solids, and several, such as Palm Springs, have the odor and white slimy bacteria that are associated with sulphur springs.

The Lake George Assemblage remains poorly known. Three crayfishes are known: *Procambarus attiguus*, *P. delicatus*, and *P. morrisi*. The first two belong to the *seminolae* group and probably are related to *Troglocambarus*, whereas *Procambarus morrisi* is related to *P. acherontis*. Riverine karsts extend north of the Lake George springs area to at least Green Cove Springs in Clay County. Divers that penetrated the spring at Green Cove reported no troglobites (WS), although more effort is necessary, possibly using baited traps, to verify their observations. More exploration in the riverine karsts along the Oklawaha River should be encouraged. The presence of *Procambarus attiguus* at Devils Sink in Putnam County and *Procambarus lucifugus* and sightings of isopods and amphipods in Silver Springs suggest a region with a complex biota.

Miami Fauna

Species List—****Crangonyx grandimanus*, ***C. hobbsi*, **Procambarus milleri*. The Miami Fauna was collected from shallow wells at the Little Bird Nursery and Garden Store in Miami (Hobbs 1971) and in northeast Homestead (HHH, personal communication). The latter site is approximately 22 km southwest of the type locality (W. Loftus, personal communication). According to Hobbs (1971), the original specimens from the type locality were obtained from a trap at the outlet of a motorized pump associated with the Little Bird well in 1968. Both

sites are associated with the Miami oolite. Parker and Cook (1944) indicated that since so much of the Miami oolite is occupied by solution holes it is highly permeable in a vertical direction and is a good aquifer that furnishes supplies to many small wells. However, they report it to have a low horizontal permeability which theoretically might restrict the dispersal of larger troglobites. This fauna is currently known from only two sites, and it should be searched for elsewhere in suitable groundwater habitats in Dade County. The Miami Fauna is associated with the Biscayne aquifer, unlike cave faunas in north Florida and south Georgia that occur in the Floridan aquifer.

FAUNAL RELATIONSHIPS

Cave crayfishes are the best indicators of faunal relationships because the other Florida troglobites either have very limited distributions or range over at least three faunal areas. Troglobitic crayfishes are found in all but the Econfina Creek Fauna.

Six crayfish lineages are involved: (1) *Cambarus* (subgenus *Jugicambarus*) represented by *Cambarus cryptodytes* restricted to the Apalachicola Fauna; (2) *Procambarus* (subgenus *Leconticambarus*), by *Procambarus milleri*, Miami Fauna; (3) *Procambarus* (subgenus *Lonnbergius*), by *Procambarus acherontis* and *P. morrisi*, St. Johns River Fauna; (4) *Procambarus* (subgenus *Ortmannicus*, Pictus Group, *lucifugus* complex), by *Procambarus erythrops*, *P. franzi*, *P. leitheuseri*, *P. lucifugus lucifugus*, *P. lucifugus alachua*, *P. lucifugus* intergrade populations, Ocala Fauna; (5) *Procambarus* (subgenus *Ortmannicus*, Pictus Group, *pallidus* complex), by *Procambarus horsti*, *P. orcinus*, *P. pallidus*, Woodville and Ocala faunas; and (6) *Procambarus* (subgenus *Ortmannicus*, Seminolae Group) and *Troglocambarus*, by *Procambarus attiguus*, *P. delicatus*, *Troglocambarus maclanei*, and *Troglocambarus* sp., St. Johns River and Ocala faunas.

Lineages 1-4—The first four lineages have restricted distributions and therefore provide little information concerning the relationships between faunal groups.

Lineage 5—The *pallidus* complex occurs in both the Woodville Fauna and the Upper Suwannee Assemblage of the Ocala Fauna. As a group, they are thought to have had a common ancestor, one similar in morphology to the extant *Procambarus leptodactylus*, which now occurs in streams north of Florida (Hobbs 1958, Franz and Lee 1982, Hobbs and Franz 1986). The distribution of the *pallidus* complex corresponds to the western slope of the old Northern Highlands described by White (1970) and is associated with Eocene limestone areas along the Cody Scarp (Fig. 6). Troglobites have not been found in the intervening

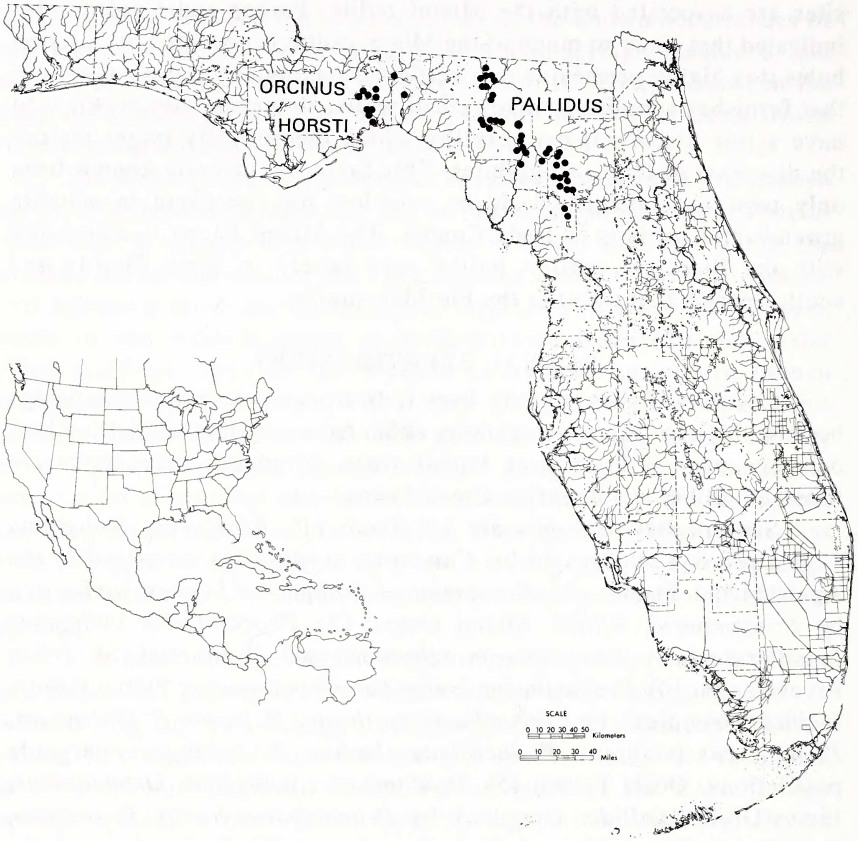

Fig. 6. Distribution of *Procambarus horsti*, *Procambarus orcinus*, and *Procambarus pallidus*.

area that separates the two faunas, although more exploration in the 50-km-wide hiatus may change this view. We suggest that the evolutionary history of the *pallidus* complex involved independent invasions of ancestral *leptodactylus*-like stocks into geographically isolated groundwater reservoirs associated with the Cody Scarp in the Woodville and Upper Suwannee areas. Subsequent evolution led to the differentiation of the *horstiorcinus* branch in the St. Marks-Wakulla-Wacissa drainages and the *pallidus* branch in the Suwannee basin.

Lineage 6—Hobbs (1942) and Hobbs and Franz (1986) pointed out the similarities between *Troglocambarus maclanei* and members of the Seminolae Group in the genus *Procambarus*. They felt that these features indicated a evolutionary relationship between the two

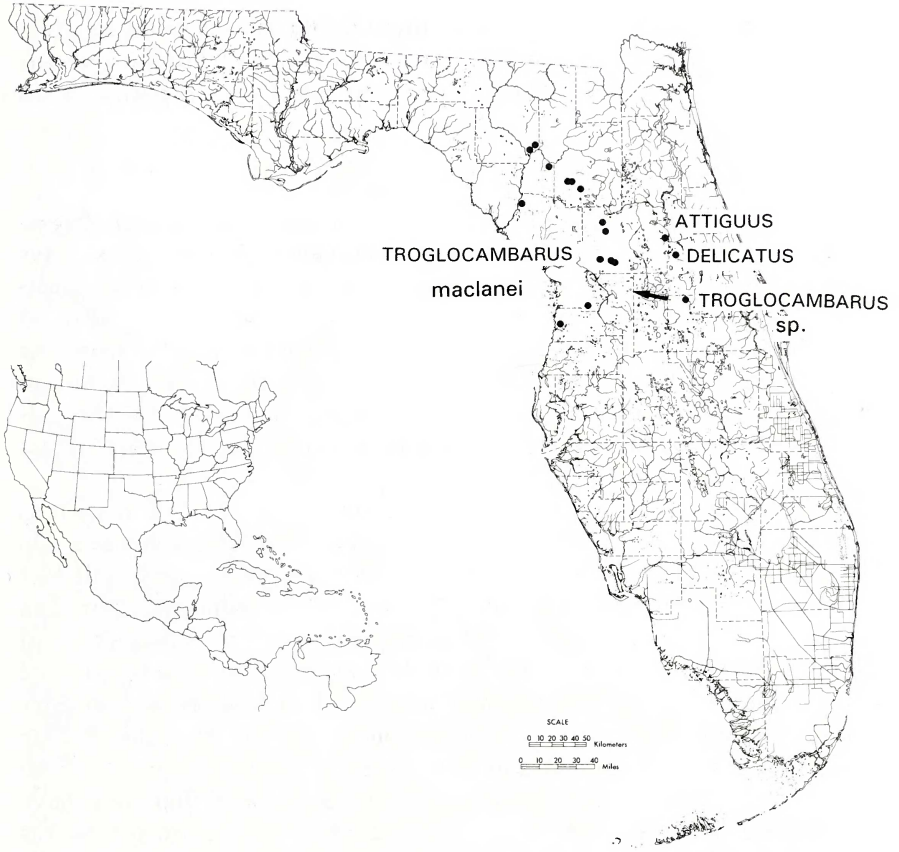

Fig. 7. Distribution of *Procambarus attiguus*, *Procambarus delicatus*, *Troglocambarus* sp., and *Troglocambarus maclanei*. Arrow shows the suggested direction for the dispersal of *Troglocambarus* lineage.

groups of crayfishes. The recent discoveries of two troglobitic members of the Seminole Group (*Procambarus attiguus* and *P. delicatus*) and an unstudied population of *Troglocambarus* in the St. Johns River basin (Fig. 7) allows for further speculation concerning the evolution of this lineage. We propose that the initial differentiation of *Troglocambarus* from ancestral *Procambarus* stocks occurred in karsts associated with the St. Johns River. Then, one branch of *Troglocambarus* dispersed from the St. Johns River karst area, via subterranean routes, into cave systems on the western slope of the Northern Highland (Fig. 7). They probably arrived on the western slope already preadapted for co-existence with larger, less specialized cave *Procambarus* (lineages 4 and 5). Unfortunately, the absence of Form I males for the Orlando

Troglocambarus prevents a more scholarly interpretation of the relationships between the St. Johns and Ocala populations of *Troglocambarus* and between the Orlando *Troglocambarus* and *Procambarus attiguus* and *P. delicatus*.

CONSERVATION

Troglobitic populations of most Florida and south Georgia faunas are potentially susceptible to human disturbance. Because these cave faunas are composed of primarily aquatic species, they could be threatened by (1) groundwater contamination that results from saltwater intrusion due to excessive pumping of groundwater and from the introduction of agricultural and industrial chemicals as well as human and domesticated animal wastes into groundwater reservoirs. Groundwater contamination may also result from vandalism and other direct human-related disturbances.

Cave fauna kills have been documented on at least four occasions in caves associated with the Suwannee and Wakulla drainages. On one occasions, Streever (1992*b*) reported a complete faunal kill that included, not only cave crayfishes, but also yellow bullheads, American eels, and *Corbicula* clams. This event followed the introduction of cold flood waters into the cave from the Suwannee River which forced the spring to reverse. The kill may have resulted from sudden changes in water temperature, oxygen deprivation, or the introductions of toxic materials. Another catfish kill was noted at White Springs, but no other information is available about the conditions that may have sponsored this event (TM). Crustacean kills were also noted at Edwards Spring and Falmouth Spring-Siphon in May 1989. Unlike Streever's account, these springs had not reversed, and there was no injection of cold water. Over 50 cave crayfish (probably *Procambarus pallidus*) and large numbers of isopods and amphipods were found dead at Edwards Spring. Divers reported that they found blue pellets spread on the ground in a managed pine forest in the vicinity of several large sinks that formed the upstream portion of the Edwards Spring cave. They suggested that the pellets were possibly a herbicide used to control hardwoods in the plantation.

The Squirrel Chimney Cave Shrimp was federally listed as Threatened (Anonymous 1990), and the Florida Cave Amphipod, Hobbs' Cave Amphipod, and Orlando Cave Crayfish are being considered as candidates for listing by the U.S. Fish and Wildlife Service (Wood 1992). The Santa Fe Cave Crayfish is considered a Species of Special Concern by the State of Florida (Wood 1992). Most of the other Florida troglobitic fauna has been proposed by the Florida

Committee on Rare and Endangered Plants and Animals for listing by the state (Franz 1982).

Populations of the following troglobitic taxa have been found in caves that occur on federal, state, and private conservation lands where they receive some protection: *Dasyscias franzi* (Econfina Blue Spring Preserve [Northwest Water Management District]), *Caecidotea hobbsi* (Dudley Farm State Historical Site [Florida Park Service]), *Caecidotea* sp. 1 (Econfina Blue Spring Preserve), *Caecidotea* sp. 2 (Rock Springs County Park), *Remasellus parvus* (Peacock Springs State Preserve [Florida Park Service]), *Crangonyx grandimanus* (Peacock Springs State Preserve, Leon Sinks Recreation Area [U.S. Forest Service], Wakulla Springs State Park [Florida Park Service]), *C. hobbsi* (Dudley Farm State Historical Site, Peacock Springs State Preserve, Wakulla Springs State Park), *Procambarus acherontis* (Wekiwa Springs State Park [Florida Park Service]), *P. attiguus* (Silver Glen Springs Recreation Area [U. S. Forest Service]), *P. delicatus* (Alexander Springs Recreation Area [U.S. Forest Service]), *P. erythrops* (Sims Sink Preserve [The Nature Conservancy]), *P. lucifugus alachua* (Dudley Farm State Historical Site), *P. lucifugus* X *alachua* (Manatee Springs State Park [Florida Park Service]), *P. orcinus* (Wakulla Springs State Park, Leon Sinks Recreation Area), *P. pallidus* (Suwannee River State Park [Florida Park Service], Peacock Springs State Preserve), *Troglocambarus maclanei* (Manatee Springs State Park), *Cambarus cryptodytes* (Florida Caverns State Park [Florida Park Service]), *Pseudosinella pecki* (Florida Caverns State Park), *Islandiana* sp. (Florida Caverns State Park), and *Haideotriton wallacei* (Florida Caverns State Park). There is no such protection for six taxa (*Procambarus franzi*, *P. horsti*, *P. leitheuseri*, Marion population of *Procambarus lucifugus* X *alachua*, *P. morrisi*, and *Troglocambarus* sp.). Important populations of these invertebrates should be incorporated into future land acquisition projects in order to reduce their chances of extinction.

CONCLUSIONS

More survey work is needed in Florida and south Georgia to understand the complex relationships between the regional faunas. New troglobites undoubtedly await discovery when cavers and cave divers explore karst windows outside normally visited areas. Large areas of the state still remain uncharted. We recommend that divers wishing to assist in future biological discoveries look in the Choctawhatchee River basin, Econfina Creek karst area in Bay and Washington counties, scarp areas between Tallahassee and the Suwannee

River, Georgia portions of the (northern) Withlacoochee River and the Flint River, St. Johns River basin, and southern Florida.

We encourage the collections of specimens of both macro- and micro-invertebrates that represent new records; specimens should be preserved in alcohol (70% ethanol) at the time of collection. All specimens should be donated to appropriate collections where they can be properly studied and curated. If maintained alive, specimens need to be brought to a specialist immediately, for upon death these fragile organisms decay rapidly and are useless.

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APPENDIX 1. List of biologically significant caves and springs in Florida and South Georgia. Sites are listed by county. Pertinent data for each site include an identification code, accepted site name (and other names when appropriate), location (section, township, range, and name of the appropriate U. S. Geological Survey quadrangle map), regional faunas and assemblages, list of species (collection, authority, or reference), ownership, and relevant references with annotations (abbreviations represent troglobitic taxa). Abbreviations used in this section are as follows: Cl=*Cambarincola leoni*, Ua=*Uncinocythere ambophora*, Ul=*U. lucifuga*, Uw=*U. warreni*, Cah=*Caecidotea hobbsi*, Rp=*Remasellus parvus*, Ch=*Crangonyx hobbsi*, Cg=*C. grandimanus*, Pc=*Palaemonetes cummingi*, Pa=*Procambarus acherontis*, Pat=*P. attiguus*, Pd=*P. delicatus*, Pe=*P. erythrops*, Ph=*P. horsti*, Pf=*P. franzi*, Ple=*P. leitheuseri*, Pla=*P. lucifugus alachua*, Pll=*Procambarus lucifugus lucifugus*, PlXa=*P. lucifugus* intergrade, Pmi=*P. milleri*, Pm=*P. morrisi*, Po=*P. orcinus*, Pp=*P. pallidus*, Cc=*Cambarus cryptodytes*, Tm=*Troglocambarus maclanei*, Tsp=*Troglocambarus* sp., Psp=*Pseudosinella pecki*, Ip=*Islandiana* sp., Df=*Dasyscias franzi*, Hw=*Haideotriton wallacei*. Other abbreviations are listed in the Methods and Acknowledgments sections.

ALACHUA COUNTY

ALA-1. ALACHUA SINK (or Lime Sink, Alachua Green Sink) (Sec.10, T.8S, R.18E, Alachua Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM), unidentified cave amphipods (TM). Private, susceptible to groundwater pollution from parking lot run-off. REFERENCES: Franz and Lee 1982 (Pp).

ALA-2. AULSBROOK CAVE (Sec.35, T.9S, R.17E, Newberry Quad.). OCALA FAUNA (Upper Suwannee), *Caecidotea hobbsi* (RF). Private. REFERENCES: Franz 1982 (Cah).

ALA-3. BARBIES CAVE (Sec.14, T.10S, R.17E, Archer Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave crayfishes (FSS files). Private.

ALA-4. BAT CAVE (Sec.18, T.9S, R.17E, Waters Lake Quad.). OCALA FAUNA (Upper Suwannee), *Caecidotea hobbsi* (USNM), *Procambarus lucifugus alachua* (USNM), and other cave associated species. Private. REFERENCES: Franz 1982 (Pla); Hobbs et al. 1977 (Pla); NcNab 1974 (bats); Relyea and Sutton 1973*b* (Pla, fish); Rice 1957 (bats).

ALA-5. BUZZARD'S ROOST (Sec.28, T.8S, R.18E, Alachua Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave crayfishes. Private.

ALA-6. CHIMNEY SINK (unidentified site). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM), other cave-associated species. Private. REFERENCES: Franz 1982 (Pp); Hobbs et al. 1977 (Pp).

ALA-7. CRUMBLY SINK (Sec.22, T.9S, R.17E, Newberry Quad.). OCALA FAUNA (Upper Suwannee), *Crangonyx hobbsi* (JRH), *Procambarus lucifugus alachua* (USNM). Private.

ALA-8. CUEVA FRIA (Sec.24, T.10S, R.18E, Arrendondo Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus lucifugus alachua* (USNM), *Procambarus pallidus* (USNM). Private. REFERENCES: Franz 1982 (Pla, Pp); Hobbs 1942*b* (Pla).

ALA-9. COW SINK (Sec.21, T.9S, R.17E, Newberry Quad.) OCALA FAUNA (Upper Suwannee), cave-associated species. REFERENCES: Marshall 1947 (fish).

ALA-10. DEVIL'S HOLE (or Glover Sink) (Sec.18, T.10S, R.18E, Archer Quad.). OCALA FAUNA (Upper Suwannee), *Crangonyx hobbsi* (Hobbs 1942*b*), *Procambarus pallidus* (USNM), other cave-associated species. Private. REFERENCES: Franz 1982 (Ch, Pp); Hobbs 1942*b* (Ch, Pp); Hobbs et al. 1977 (Pp).

ALA-11. DOUBLE-BARREL SINK (or Double Sink Cave) (Sec. 24, T.10S, R.17E, Archer Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave crayfishes (BHT, pers. comm., 1975). Private.

ALA-12. DUDLEY CAVE (Sec.32, T.9S, R.18E, Newberry Quad.). OCALA FAUNA (Upper Suwannee), *Caecidotea hobbsi*-type locality (USNM), *Crangonyx hobbsi* (JRH), *Procambarus lucifugus alachua* (USNM), other cave-associated species. Public, Dudley Farm State Historical Site, Florida Dept. Natural Resources. REFERENCES: Franz 1982 (Cah, Ch, Pla); Hobbs 1942*b* (Cah, Ch, Pla); Krause 1990*a* (cave description, map); Maloney 1939 (Cah-type description); Peck 1970 (terrestrial arthropods); Warren 1961 (Cah, Ch, Pla).

ALA-13. DUDLEY TUNNEL (or Dudleys Cave II) (Sec.32, T.9S, R.18E, Newberry Quad.). OCALA FAUNA (Upper Suwannee), *Caecidotea hobbsi* (USNM). Public, Dudley's Farm State Historical Site, Florida Dept. Natural Resources. REFERENCES: Franz 1982 (Cah); Hobbs 1942 (Cah); Krause 1990*a* (cave description, map); Warren 1961 (Cah).

ALA-14. DUFF'S CAVE (Sec.14, T.10S, R.17E, Archer Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave crayfishes (FSS files). Private.

ALA-15. FELLOE CAVE (Sec.2, T.10S, R.18E, Gainesville West Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave crayfishes (FSS files). Private.

ALA-16. FERN CAVE (or Fern Sink) (Sec.34, T.8S, R.17E, Newberry Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave crayfish (FSS files), other cave-associated species. Private.

ALA-17. GOAT SINK (Sec.20, T.9S, R.18E, Newberry Quad.). OCALA FAUNA (Upper Suwannee), *Crangonyx hobbsi*, *Procambarus lucifugus alachua* (USNM), *Procambarus pallidus*, *Troglocambarus maclanei* (USNM), other cave-associated species. Private. REFERENCES: Cooper 1965*b* (Pla, cave description); Hobbs 1942*b* (Pla); Hobbs et al. 1977 (Pla, Pp); Holt 1973*b* (Cl as commensal on Pla); Lee 1969*c* (bullfrogs); Warren 1961 (Pla).

ALA-18. GRANT'S CAVE (Sec.3, T.10S, R.18E, Newberry Quad.). OCALA FAUNA, cave-associated species. Private. REFERENCES: Peck 1970 (terrestrial arthropods); Rice 1957 (bats).

ALA-19. HAGUE CAVE (Sec.9, T.8S, R.18E, High Springs Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave crayfishes (FSS files). Private.

ALA-20. HERTZOG CAVE (or Herzog's Cave, Wagon Wheel Cave) (Sec. line 17/18, T.10S, R.19E, Arrendondo Quad.). OCALA FAUNA (Upper Suwannee), *Crangonyx grandimanus* (JRH), *Procambarus pallidus* (USNM), *Troglocambarus maclanei* (USNM). Private.

ALA-21. HIGH SPRINGS CAVE (Sec.2, T.8S, R.17E, High Springs Quad.). OCALA FAUNA (Upper Suwannee), *Crangonyx hobbsi*, *Procambarus pallidus* (USNM). Private. REFERENCES: Franz 1982 (Ch, Pp); Hobbs 1942*b* (Ch, Pp); Hobbs et al. 1977 (Pp); Warren 1961 (Ch, Pp).

ALA-22. HOG SINK (Sec.24, T.10S, R.18E, Arrendondo Quad.). OCALA FAUNA (Upper Suwannee), *Uncinocythere lucifuga* (Walton and Hobbs 1959), *Procambarus lucifugus alachua*-type locality (USNM), *Procambarus pallidus* (USNM), other cave-associated species. Private. REFERENCES: Franz 1982 (Ch, Pla); Franz and Lee 1982 (Pla); Hobbs 1942*b* (Pla); Hobbs et al. 1977; (Pla) Marshall 1947 (fish); Rice 1957 (bats); Walton and Hobbs 1959 (Ul); Warren 1961 (Ch, Pla, Pp).

ALA-23. HORNSBY SINK (Sec.26, T.7S, R.17E, High Springs Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM). Private, children's camp. REFERENCES: Franz 1982 (Pp); Hobbs et al. 1977 (Pp).

ALA-24. HORNSBY SPRING (Sec.27, T.7S, R.17E, High Springs Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus*

(ATL). Private, children's camp. REFERENCES: Auffenberg 1957*a* (fossils); Dolan and Allen 1961 (archeology), Lane 1986 (geology), Rosenau et al. 1977 (spring description); Webb 1974 (fossils).

ALA-25. HUGGINS CAVE (Sec.35, T.8S, R.17E, Newberry Quad.). OCALA FAUNA (Upper Suwannee), *Crangonyx grandimanus*, *Crangonyx hobbsi*-type locality (USNM). Private. REFERENCES: Franz 1982 (Cg, Ch); Shoemaker 1941 (Ch-type description); Warren 1961 (Cg, Ch).

ALA-26. JEROME SINK (Sec.22, T.9S, R.17E, Newberry Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave crayfishes (FSS files), other cave-associated species. Private. REFERNCES: Marshall 1947 (fish).

ALA-27. JONES CAVE (or Witches Den) (Sec.17, T.9S, R.17E, Waters Lake Quad.). OCALA FAUNA (Upper Suwannee), cave-associated species. REFERENCES: McNab 1974 (bats).

ALA-28. JOOK'S CAVE (unidentified site). OCALA FAUNA (Upper Suwannee), cave-associated species. REFERENCES: Hubbell 1936 (crickets); Peck 1970 (terrestrial arthropods).

ALA-29. MARTIN'S CAVE (possibly Seven Chimneys) (Sec.18, T.9S, R.17E, Waters Lake Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus lucifugus alachua*, other cave-associated species. Private. REFERENCES: Franz 1982 (Pla); Relyea and Sutton 1973*b* (Pla, catfish).

ALA-30. MCGEEHEE BLUE HOLE (Sec.15, T.9S, R.17E, Newberry Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (ATL). Private.

ALA-31. MCGEEHEE CHIMNEY (Sec.16, T.9S, R.17E, Newberry Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave crayfishes (FSS files). Private.

ALA-32. O'STEEN'S CAVE (Sec.26, T.8S, R.17E, High Springs Quad.). OCALA FAUNA (Upper Suwannee), cave-associated species. REFERENCES: Hubbell 1936 (crickets); Peck 1970 (terrestrial arthropods).

ALA-33. PALLIDUS SINK (Sec.15, T.8S, R.17E, High Springs Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM). Private. REFERENCES: Franz 1982 (Pp); Hobbs 1942*b* (Pp); Hobbs et al. 1977 (Pp); Warren 1961 (Pp).

ALA-34. POWERHOUSE SINK (Sec.22, T.8S, R.18E, Alachua Quad.). OCALA FAUNA (Upper Suwannee), unidentified crayfishes (FSS files). Private.

ALA-35. PROTHEROE SINK (Sec.24, T.10S, R.18, Arrendondo Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus lucifugus*

alachua (Cooper 1965*b*), *Procambarus pallidus* (Cooper 1965*b*). Private. REFERENCES: Cooper 1965*b* (Pla, Pp, cave description); Franz 1982 (Pla. Pp); Hobbs et al. 1977 (Pla, Pp); Warren 1961 (Pla, Pp).

ALA-36. SCHOUTEN CAVE (Sec.5, T.10S, R.18E, Newberry Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave crayfishes (FSS files). Private.

ALA-37. SEVEN CHIMNEYS SINK (Sec.17, T.9S, R.17E, Waters Lake Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus lucifugus alachua*. REFERENCES: Franz 1982 (Pla); Hobbs et al. 1977 (Pla); McNab 1974 (bats).

ALA-38. SQUIRREL CHIMNEY (Sec.21, T.9S, R.18E, Newberry Quad.). OCALA FAUNA (Upper Suwannee), *Uncinocythere lucifuga* (Walton and Hobbs 1959), *Palaemonetes cummingi*-type locality (USNM), *Procambarus lucifugus alachua*, *Procambarus pallidus* (USNM), *Troglocambarus maclanei*-type locality (USNM), other cave-associated species. Private. REFERENCES: Anonymous 1990 (Pc, federal conservation status); Dickson and Franz 1980 (Pp, gill respiration); Dobkin 1971 (Pc, larval development); Franz 1982 (Ch, Pc, Pla, Pp, Tm); Franz and Lee 1982 (Pla, Pp, Tm, ecology); Hobbs 1942*a* (Tm-type description), 1942*b* (Pp, Tm); Hobbs et al. 1977 (Pla, Pp, Tm); Holt 1973*b* (Cl as commensal of TM); Mohr and Poulson 1966 (Pla, Tm, cave description, photo); Morris and Butt 1992 (Pc, cave description); Peck 1970 (terrestrial arthropods); Relyea and Sutton 1973*a* (Pp, egg-bearing); Walton and Hobbs 1959 (Ul); Warren 1961 (Pp, Tm).

ALA-39. STILL SINK (Sec.29, T.9S, R.18E, Newberry Quad.). OCALA FAUNA (Upper Suwanneee), *Crangonyx hobbsi* (JRH), *Procambarus pallidus* (USNM). Private. REFERENCES: Cooper 1965*b* (Pp, cave description); Franz 1982 (Pp); Hobbs, et al. 1977 (Pp).

ALA-40. TEN INCH CAVE (Sec.3, T.9S, R.17E, Newberry Quad.). OCALA FAUNA (Upper Suwannee), *Remasellus parvus*-type locality (USNM). Private. REFERENCES: Steeves 1964 (Rp, type description).

ALA-41. TUSK CAVE (Sec.34, T.9S, R.18E, Gainesville West Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus lucifugus alachua* (USNM). Private. REFERENCES: Franz and Lee 1982 (Pla).

ALA-42. WARREN CAVE (Sec.13, T.9S, R.18E, Gainesville West Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus*-type locality (USNM), other cave-associated species. Private, National Speleological Society, cave preserve. REFERENCES: Franz 1982 (Pp); Franz and Lee 1982 (Pp); Hobbs 1942*b* (Pp, type description);

Hobbs et al. 1977 (Pp); Krause 1992 (cave description, map); McNab 1974 (bats); Peck 1970 (terrestrial arthropods); Warren 1961 (Pp).

ALA-43. WELL, FORT CLARK CHURCH. (Sec.31-32, T.9S. R.19E, Gainesville West. Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM). Private. REFERENCES: Franz 1982 (Pp); Hobbs et al. 1977 (Pp).

ALA-44. WELL, MICANOPY (Unidentified site). OCALA FAUNA (Orange Lake), *Caecidotea hobbsi* (USNM). Private. REFERENCES: Steeves 1964 (Cah).

ALA-45. WELL, MICANOPY (Archie Carr Farm) (Sec.34, T.11S, R.20E, Flemington Quad.). OCALA FAUNA (Orange Lake), *Crangonyx grandimanus* (JRH), *Crangonyx hobbsi* (JRH). Private.

ALA-46. ZAMIA SINK (Sec.8, T.10S, R.18E, Newberry Quad.). OCALA (Upper Suwannee), cave-associated species. REFERENCES: Marshall 1947 (fish).

ALA-47. 32-FOOT CAVE (Sec.18, T.10S, R.19E, Gainesville West Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM). Private. REFERENCES: Franz and Lee 1982 (Pp).

CITRUS COUNTY

CIT-1. CAVE (6 mi N of Lecanto). OCALA FAUNA (Withlacoochee), cave-associated species. REFERENCES: McNab 1974 (bats).

CIT-2. BLOWING HOLE CAVE (Sec.21, T.20S, R.19E, Brooksville NW Quad.). OCALA FAUNA (Withlacoochee), cave-associated species. Public, Withlacoochee State Forest, Florida Dept. Agriculture, gated cave. REFERENCES: Hubbell 1936 (crickets); Peck 1970 (terrestrial arthropods).

CIT-3. DR. DAMES CAVE (or Dr. Doan's Cave) (Sec.30, T.20S, R.19E, Brooksville NW Quad.). OCALA FAUNA (Withlacoochee), cave-associated species. Public, Withlacoochee State Forest, Florida Dept. Agriculture. REFERENCES: Hubbell 1936 (crickets); Peck 1970 (terrestrial arthropods).

CIT-4. HALL'S BAT CAVE (or Rock Pile Cave, also known as Trail 10 Cave) (Sec.30, T.19S, R.18E, Brooksville NW Quad.). OCALA FAUNA (Withlacoochee), cave-associated species. REFERENCES: Lee field notes.

CIT-5. HOMOSASSA SPRINGS. (Sec.28, T.19S., R.17E., Homosassa Quad.). OCALA FAUNA (?), unidentified cave amphipods and isopods. Public, Homosassa Springs State Park, Florida Dept. Natural Resources. REFERENCES: Rosenau et al. 1977; Karst Environ-mental Services (cave map).

CIT-6. RESTINGHOUSE SIPHON (Sec.28, T.19S., R.17E, Homosassa Quad.). OCALA FAUNA, cave-associated species (snails). Private.

CIT-7. SWEET GUM CAVE (Sec.36, T.20S, R.19E, Nobleton Quad.). OCALA FAUNA (Withlacoochee), *Crangonyx hobbsi* (JRH), *Procambarus lucifugus lucifugus*-type locality (USNM), *Troglocambarus maclanei* (USNM), other cave-associated species. Private. REFERENCES: Faxon 1898 (Pll as Pa); Franz 1982 (Pll); Hobbs 1940*a* (Pll, type description); 1942*b* (Pll); Hobbs et al. 1977 (Pll); Hobbs III 1992 (photo of Pll); Hubbard 1901 (terrestrial arthropods); Mohr and Poulson 1966 (Pll); Warren 1961 (Pll).

COLUMBIA COUNTY

COL-1. BIG GRUNGY SWALLET (Sec.22, T.7S, R.17E, High Springs Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM), unidentified cave amphipods (TM). Public, O'Leno State Park, Florida Dept. Natural Resources. REFERENCES: TM (map).

COL-2. BIG ROOM CAVE SINK (Sec.18, T.7S, R.17E, Fort White Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (TM), unidentified cave amphipods (TM). Private.

COL-3. BUSSEY SINK (Sec.18, T.7S, R.17E, Fort White Quad.). OCALA FAUNA (upper Suwannee), *Crangonyx hobbsi* (JRH), *Procambarus pallidus* (USNM), other cave-associated species. Private.

COL-4. COLUMBIA SPRINGS (or Olustee Creek Spring) (Sec.29, T.6S, R.18E, Mikesville Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (TM). Private. REFERENCES: TM (map).

COL-5. FOSSIL CAVE SINK (or Jebs Hole) (sensitive, T.7S, R.17E, High Springs SW Quad.). Private. OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (TM), *Troglocambarus maclanei* (TM), unidentified cave amphipods (TM). REFERENCES: TM (map).

COL-6. JUG SPRING (or Blue Hole Spring) (Sec.7, T.6S, R.16E, Hildreth Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave amphipods and isopods (TM), other cave-associated species. Public, Ichetucknee River State Park, Florida Dept. Natural Resources. REFERENCES: Rosenau, et. al. 1977 (spring description); Auffenberg 1957*b* (fossils, cave map).

COL-7. RIVERBED CAVE (Sec.19, T.7S, R.17E, High Springs SW Quad.). OCALA FAUNA (Upper Suwannee), *Crangonyx hobbsi* (Hobbs 1942b), *Procambarus pallidus* (USNM), other cave-associated species. Private, railroad right-of-way. REFERENCES: Franz 1982 (Pp); Hobbs 1940*a* (Pp), 1942*b* (Ch, Pp, cave description); Hobbs et al. 1977 (Pp); Warren 1961 (Ch, Pp).

COL-8. ROBINS NEST SPRING/SIPHON. (Sec.35, T.6S, R.16E, Fort White Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave amphipods and crayfishes (TM). Private.

COL-9. ROSE CREEK SWALLET I (or Duckweed I) (Sec.10, T.5S, R.16E, Columbia Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM), unidentified cave amphipods and isopods (TM), other cave-associated species. Private. REFERENCES: TM (map).

COL-10. ROSE CREEK OVERFLOW SWALLET (or Duckweed II) (Sec. 15, T.5S, R.16E, Columbia Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (TM), unidentified cave ampipods and isopods (TM), other cave-associated species. Private. REFERENCES: TM (map).

COL-11. RUSSELL'S RUB (Sec.1, T.6S, R.15E, Hildreth Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (TM). Private.

COL-12. SHILOH CAVE (or Railroad Cave) (Sec.13, T.7S, R.16E, Fort White Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM). Private, railroad right-of-way.

COL-13. SIPHON CREEK CAVE (Sec.28, T.7S, R.16E, High Springs SW Quad.). OCALA FAUNA (Upper Suwannee), cave-associated species. Public, state waters.

COL-14. TROOP SINK (sensitive, T.5S, R.14E, O'Brien SE Quad.). OCALA FAUNA (Upper Suwannee), unidentified crayfishes (*Procambarus lucifugus* complex ?) (TM). Private. REFERENCES: TM (map).

COL-15. WHITE SPRINGS (Sec.7, T.2S., R.16E, White Springs West Quad.). OCALA FAUNA (Upper Suwannee), cave-associated species. REMARKS: Catfish kill in cave (TM).

DADE COUNTY

DAD-1. WELL, LITTLE BIRD NURSERY AND GARDEN STORE (Sec.15, T.54S, R.40E, South Miami Quad.). MIAMI FAUNA, *Crangonyx grandimanus* (JRH), *Crangonyx hobbsi* (JRH), *Procam-barus milleri*-type locality (USNM), other cave-associated species. Private, commercial site. REFERENCES: Franz 1982 (Pmi); Franz and Lee 1982 (Pmi); Hobbs 1971 (Pmi-type description); Hobbs et al. 1977 (Pmi); Holsinger 1972 (Ch, Cg).

DAD-2. WELL 4.5 KM NORTHEAST OF HOMESTEAD (Sec.29, T.56S, R.39E, Goulds Quad.). MIAMI FAUNA, *Procambarus milleri* (USNM). Private. REMARKS: Five specimens were taken from a nine meter deep well in the Biscayne aquifer on 1 June 1992 and 22 August

1992 by W. F. Loftus and P. Radice (W. F. Loftus and HHH, pers. comm.).

GILCHRIST COUNTY

GIL-1. DEVIL'S EYE AND EAR SPRINGS (Sec.34, T.7S, R.16E, Hildreth Quad.). Ginnie Springs Cave System. OCALA FAUNA (Upper Suwannee), *Crangonyx grandimanus* (JRH), *Crangonyx hobbsi* (JRH), *Procambarus pallidus* (USNM), *Troglocambarus maclanei* (USNM). Public, state waters, proximity of commercial recreation area. REFERENCES: Franz and Lee 1982 (Pp); Rosenau et al. 1977 (spring description).

GIL-2. GINNIE SPRINGS (Sec.34, T.7S, R.16E, High Springs Quad.). Ginnie Springs Cave System. OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (Pp). Private, commercial recreation area. REFERENCES: Franz and Lee 1982 (Pp); Rosenau et al. 1977 (spring description).

GIL-3. HART SPRINGS (Sec. 30, T.9S, R.14E, Wannee Quad.). OCALA FAUNA (Lower Suwannee), unidentified cave crayfishes and amphipods (TM). Public, Hart Springs County Park, Gilchrist County.

GIL-4. KELLEY'S SINKS (Sec.34, T.8S, R.14E, Wannee Quad.). OCALA FAUNA (Lower Suwannee), *Procambarus lucifugus X alachua* (RF). Private. REFERENCES: Franz and Lee 1982 (PlXa); FSS files.

GIL-5. LITTLE DEVIL'S SPRING (Sec.34, T.7S, R.16E, High Springs SW Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave amphipods (TM). REFERENCES: WS (map).

GIL-6. OLD WALKER FARM SINKS (Sec.3, T.9S, R.14E, Wannee Quad.). OCALA FAUNA (Lower Suwannee), *Procambarus lucifugus X alachua* (USNM). Private. REFERENCES: Franz 1982 (PlXa); Franz and Lee 1982 (PlXa).

GIL-7. OTTER SPRINGS (Sec.6, T.10S, R.14E, Wannee Quad.). OCALA FAUNA (Lower Suwannee), unidentified cave crayfishes and amphipods (TM), other cave-associated species (TM). Private, commercial recreation area. REFERENCES: Rosenau et. al. 1977 (spring description).

GIL-8. ROBERT'S CAVE (or Bells Bat Cave, Bat Hole) (Sec.11, T.9S, R.14E, Wannee Quad.). OCALA FAUNA (Lower Suwannee), *Procambarus lucifugus X alachua* (Warren 1961), other cave-associated species. Private. REFERENCES: Franz 1982 (PlXa); Hobbs et al. 1977 (PlXa); Holt 1973*b* (Cl as commensal on Pla); Rice 1957 (bats); Warren 1961 (PlXa).

GIL-9. ROCK BLUFF SPRING (Sec.9, T.8S, R.14E., Hatchbend Quad.). OCALA FAUNA (Upper Suwannee), *Crangonyx* sp.? (JRH), *Procambarus pallidus* (USNM). Private. REFERENCES: Rosenau et al. 1977 (spring description).

HAMILTON COUNTY

HAM-1. ADAMS SPRING/SIPHON (Sec.8, T.1S, R.12E, Ellaville Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (TM). Private.

HAM-2. CORBET SPRING CAVE (Sec. 10, T.1N., R.11E., Octahatchee Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM). Private.

HAM-3. FIRECRACKER CAVE (Sec. 5, T.1N, R.11E., Octahatchee Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM), unidentified cave amphipods and isopods, other associated-cave species. Private. REFERENCES: Pruitt 1991*c*, 1992 (Pp, cave description, map, biota).

HAM-4. HYDRANT SPRING (sensitive, T.1S, R.12E, Ellaville Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave crayfishes (TM). Public, state waters. REFERENCES: TM (map).

HAM-5. NATURAL BRIDGE SPRING (sensitive, T.1S, R.12E, Ellaville Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave crayfishes. Public, Suwannee River State Park, Florida Dept. Natural Resources. REFERENCES: TM (map).

HAM-6. OVERFLOW SPRING CAVE (Sec.13, T.1S, R.11E, Ellaville Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM), unidentified cave amphipods (TM). Public, Suwannee River State Park, Florida Dept. Natural Resources.

HAM-7. POTT SPRING (sensitive, T.1N, R.11E, Ellaville Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (TM), unidentified cave amphipods (TM). Private.

HAM-8. RAVINE INTERMITTENT SPRING (sensitive, T.1S, R.12E, Ellaville Quad.). unidentified cave crayfishes (TM). Private.

HAM-9. ROSSITER SPRING (sensitive, T.1N, R.11E, Octahatchee Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (TM), unidentified cave amphipods (TM). Private.

HAM-10. SHALLOW SPRING (Sec.10, T.1N, R.11E, Ellaville Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM), unidentified cave amphipods (TM), cave-associated species (snails). Private.

HAM-11. UNDERHUNG SINK (Sec.23, T.1N, R.11E, Ellaville Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM). Private.

HERNANDO COUNTY

HER-1. CAVE (unidentified site 23.3 km [14 mi] N of Weekiwachee Springs). OCALA FAUNA (Withlacoochee), *Procambarus lucifugus lucifugus* (USNM). REMARKS: Two specimens (Form I male and female) collected by Albert Greenburg in 1937 (data with USNM specimens). Franz 1982 (Pll); Hobbs 1940*a* (Pll), 1942*b* (Pll); Hobbs et al. 1977 (Pll); Warren 1961 (Pll).

HER-2. DIE POLDER 2 SINK (Sec.5, T.23S, R.18E, Weekiwachee Springs Quad.). OCALA FAUNA (Gulf Coastal Lowlands), *Procambarus leitheuseri* (USNM). Private, boy scout camp. REFERENCES: Franz and Hobbs 1983 (Ple).

HER-3. DIE POLDER 3 SINK (Sec.5, T.23S, R.18E, Weekiwachee Springs Quad.). OCALA FAUNA (Gulf Coastal Lowlands), *Procambarus leitheuseri* (USNM), *Troglocambarus maclanei* (TM), other cave-associated species. Private, boy scout camp. REFERENCES: Franz and Hobbs 1983 (Ple).

HER-4. EAGLE'S NEST SINK (or Lost Sink) (Sec.21, T.22S, R.17E, Weekiwachee Springs Quad.). OCALA FAUNA (Gulf Coastal Lowlands), *Crangonyx grandimanus* (JRH), *Crangonyx hobbsi* (JRH), *Procambarus leitheuseri*-type locality (USNM), *Troglocambarus maclanei* (USNM), other cave-associated species. Private. REFERENCES: Franz and Hobbs 1983 (Ple-type description).

HER-5. LITTLE SALT SPRINGS (Sec.29, T.22S, R.17E, Weekiwachee Springs Quad.). OCALA FAUNA (Gulf Coastal Lowlands), *Procambarus leitheuseri* (ATL). Private. REFERENCES: Franz and Hobbs 1983 (Ple); Rosenau et al. 1977 (spring description).

HER-6. LITTLE SPRINGS (or Twin D's) (Sec.2, T.22S, R.17E, Weekiwachee Springs Quad.). OCALA FAUNA (Gulf Coastal Lowlands), *Procambarus leitheuseri* (ATL). Private, commercial attraction (Weekiwachee Springs). REFERENCES: Franz and Hobbs 1983 (Ple); Rosenau et al. 1977 (spring description), Wetterhall 1965 (hydrology).

HOLMES COUNTY

HOL-1. VORTEX BLUE SPRING (Sec.9, T.4N, R.17W, Prosperity Quad.). Unstudied cave crayfish (USNM), other cave-associated species. Private, commercial recreation site. REMARKS: This spring occurs in the Choctawhatchee drainage, west of the Marianna Lowlands of Jackson

County. At least three other large springs occur in this county (Rosenau et al. 1977). Recent collections of cave crustaceans in the Vortex system suggests that this spring area is in need of more explora-tions. REFERENCES: Helfman 1986 (fish); Rosenau et al. 1977 (spring description).

JACKSON COUNTY

JAC-1. BAT CAVE (unidentified site). APALACHICOLA FAUNA (Marianna Lowlands), cave-associated species. REMARKS: Hubbell (1936) indicated the cave was located on the bank of the Chipola River near Marianna. REFERENCES: Hubbell 1936 (crickets); Peck 1970 (terrestrial arthropods).

JAC-2. BLUE HOLE SPRING (Sec.21, T.5N, R.10W, Marianna Quad.). APALACHICOLA FAUNA (Marianna Lowlands), *Cambarus* cf. *cryptodytes* (USNM). Public, Florida Caverns State Park, Florida Dept. Natural Resources. REMARKS: Unusual crayfish specimen; more material is needed from this site in order to determine this population's specific identity (HHH).

JAC-3 BLUE SINK (Sec.2, T.3N, R.11N, Kynesville Quad.). APALACHICOLA FAUNA (Marianna Lowlands), *Haideotriton wallacei* (TM). Private.

JAC-4. CAVE-IN-WOODS (Sec.26, T.5N, R.11W, Cottondale East Quad.). APALACHICOLA FAUNA (Marianna Lowlands), *Cambarus cryptodytes* (RF), *Haideotriton wallacei* (RF). Private. REFERENCES: Franz and Lee 1982 (Cc).

JAC-5. CHINA CAVE (Sec.27, T.5N, R.10W, Marianna Quad.). APALACHICOLA FAUNA (Marianna Lowlands), *Haideotriton wallacei*, other cave-associated species. Public, Florida Caverns State Park, Florida Dept. Natural Resources. REFERENCES: Hobbs III 1992 (Hw, photo).

JAC-6. COFFIN SPRING (Sec.35, T.4N, R.11W, Kynesville Quad.). APALACHICOLA FAUNA (Marianna Lowlands), unidentified crayfishes (TM). REFERENCES: map (TM, WS).

JAC-7. ELLIS CAVE (or Honey Comb Hill Cave) (Sec.28, T.5N, R.10W, Marianna Quad.). APALACHICOLA FAUNA (Marianna Lowlands), *Cambarus cryptodytes* (USNM), *Haideotriton wallacei* (RF), other cave-associated species. Private. REFERENCES: Brockman and Bortone 1977 (fish); Franz 1982 (Cc); Hobbs et al. 1977 (Cc).

JAC-8. FLORIDA CAVERNS (commercial cave?) (Sec.27, T.5N, R.11E, Marianna Quad.). APALACHICOLA FAUNA (Marianna Lowlands), cave-associated species. Public, Florida Caverns State Park, Florida Dept. Natural Resources. REFERENCES: Lane 1986 (cave description); Peck 1970 (terrestrial arthropods); Vandel 1965*a* (biota).

JAC-9. GERARD'S CAVE (or Sam Smith Cave) (Sec.23, T.5N, R.11E, Cottondale East Quad.). APALACHICOLA FAUNA (Marianna Lowlands), *Caecidotea hobbsi* (USNM), *Cambarus cryptodytes* (USNM), *Haideotriton wallacei* (UF, USNM, NCSM, MCZ), other cave-associated species. Private. REFERENCES: Caine 1978 (Cc, ecology); Franz 1982 (Cc); Franz et al. 1971 (snails); Hobbs et al. 1977 (Cc); Lee 1969*a*, 1969*b*, 1969*c*, 1969*d* (cave-associated species); Pylka and Warren 1958 (Hw); Warren 1961 (Cah, Cc, Hw).

JAC-10. GEROME'S CAVE (or Bumpnose Cave) (Sec.18, T.5N, R.10W, Cottondale East Quad.). APALACHICOLA FAUNA (Mari-anna Lowlands). *Cambarus cryptodytes* (DSL), other cave-associated species.

JAC-11. HOLE-IN-WALL SPRING (Sec.5, T.4N, R.9W, Marianna Quad.). APALACHICOLA FAUNA (Marianna Lowlands), *Cambarus cryptodytes* (USNM), *Haideotriton wallacei* (UF), unidentified amphipods (TM). Private. REFERENCES: Exley 1978 (cave description, map).

JAC-12. JACKSON BLUE SPRING (Sec.33, T.5N, R.9W, Marianna Quad.). APALACHICOLA FAUNA (Marianna Lowlands), *Cambarus cryptodytes* (USNM), *Haideotriton wallacei* (JB). Public, state waters.

JAC-13. JUDGES CAVE (Sec.35, T.5N, R.10W, Marianna Quad.). APALACHICOLA FAUNA (Marianna Lowlands), *Cambarus cryptodytes* (Warren 1961), *Haideotriton wallacei* (Warren 1961). Public, Judges Cave Bat Preserve, Florida Game and Fresh Water Fish Commission. REFERENCES: Franz 1982 (Cc); Hobbs et al. 1977 (Cc); Warren 1961 (Cc, Hw).

JAC-14. LIMESTONE CAVE AT BLUE SPRING (unidentified site). APALACHICOLA FAUNA (Marianna Lowlands), cave-associated species. REMARKS: Hubbell (1936) listed the site as "...small limestone caves at Blue Spring."REFERENCES: Hubbell 1936 (crickets); Peck 1970 (terrestrial arthropods).

JAC-15. KRAMER'S CAVE (unidentified cave in Florida Caverns State Park). APALACHICOLA FAUNA (Marianna Lowlands), cave-associated species. Public, Florida Caverns State Park, Florida Dept. Natural Resources. REFERENCES: Franz et al. 1971 (snails).

JAC-16. MILLER'S CAVE (Sec.28, T.5N, R.10W, Marianna Quad.). APALACHICOLA FAUNA (Marianna Lowlands), *Cambarus cryptodytes* (RF), *Haideotriton wallacei* (RF), *Pseudosinella pecki* (Christiansen and Bellinger 1980), other cave-associated species. Public, Florida Caverns State Park, Florida Dept. Natural Resources. REFERENCES: Christiansen and Bellinger 1980 (Psp); Peck 1970 (terrestrial arthropods); Klimaszewski and Peck 1986 (beetles).

JAC-17. MILTON'S CAVE (Sec.13, T.5N, R.11W, Cottondale East Quad.). APALACHICOLA FAUNA (Marianna Lowlands), cave-associated fauna.

JAC-18. MILTON'S WELL CAVE (Sec.13, T.5N, R11W, Cottondale East Quad.). APALACHICOLA FAUNA (Marianna Lowlands), *Cambarus cryptodytes* (DSL), *Haideotriton wallacei* (DSL), other cave-associated species. Private. REFERENCES: Franz 1982 (Cc); Franz et al. 1971 (snails); Hobbs et al. 1977 (Cc).

JAC-19. MUD CAVE (Sec.3, T.4N, R.10E, Marianna Quad.). APALACHICOLA FAUNA (Marianna Lowlands), cave-associated species. Private. REFERENCES: Rice 1957 (bats).

JAC-20. OLD INDIAN CAVE (Sec.21, T.5N, R.10W, Marianna Quad.). APALACHICOLA FAUNA (Marianna Lowlands), cave-associated species. Public, Florida Caverns State Park, Florida Dept. Natural Resources. REFERENCES: Lee and Tuttle 1970 (bat protection); McNab 1974 (bats); Peck 1970 (terrestrial arthropods); Rice 1955*a*, 1955*b* (bats).

JAC-21. POOL CAVE (or Pond Cave, Salamander Cave) (Sec.27, T.5N, R.10W, Marianna Quad.). APALACHICOLA FAUNA (Marianna Lowlands), *Cambarus cryptodytes* (RF), *Haideotriton zwallacei* (UF), other cave-associated species. Public, Florida Caverns State Park, Florida Dept. Natural Resources. REFERENCES: Franz 1982 (Cc); Hobbs et al. 1977 (Cc).

JAC-22. POTTERY CAVE (Sec.27/28, T.5N, R.10W, Marianna Quad.). APALACHICOLA FAUNA (Marianna Lowlands), *Cambarus cryptodytes* (Warren 1961), other cave-associated species. Public, Florida Caverns State Park, Florida Dept. Natural Resources. REFERENCES: Franz 1982 (Cc); Franz et al. 1971 (snails); Hobbs et al. 1977 (Cc).

JAC-23. RAY'S CAVE (Sec.22, T.5N, R.11W, Cottondale East Quad.). APALACHICOLA FAUNA (Marianna Lowlands), *Cambarus cryptodytes*. Private. REFERENCES: FNAI record.

JAC-24. RIVER CAVE (unidentified cave in Florida Caverns State Park). APALACHICOLA FAUNA (Marianna Lowlands), cave-associated species. Public, Florida Caverns State Park, Florida Dept. Natural Resources. REFERENCES: Peck 1970 (terrestrial arthropods).

JAC-25. ROCKWELL CAVE (unidentified site). APALACHICOLA FAUNA (Marianna Lowlands), *Cambarus cryptodytes* (Franz 1982). REFERENCES: Franz 1982 (Cc); Hobbs et al. 1977 (Cc).

JAC-26. SODA STRAW CAVE (or Walt's Misery) (Sec.2, T.4N, R.10W, Marianna Quad.) APALACHICOLA FAUNA (Marianna Low-

lands), *Cambarus cryptodytes* (Warren 1961). Public, Florida Caverns State Park, Florida Dept. Natural Resources. REFERENCES: Franz 1982 (Cc); Hobbs et al. 1977 (Cc); Warren 1961.

JAC-27. "SPRING CAVE" (unidentified cave in Florida Caverns State Park). APALACHICOLA FAUNA (Marianna Lowlands), cave-associated species. Public, Florida Caverns State Park, Florida Dept. Natural Resources. REFERENCES: Peck 1970 (terrestrial arthropods).

JAC-28. SWEETWATER SPRING (=Bozell Spring) (Sec.16, T.7N, R.10W, Marianna Quad.). APALACHICOLA FAUNA (Marianna Lowlands), unidentifed cave crayfishes (TM). Private.

JAC-29. TWIN CAVE (Sec.6, T.4N, R.9W, Marianna Quad.). APALACHICOLA FAUNA (Marianna Lowlands), *Cambarus cryptodytes* (RF), *Haideotriton wallacei* (RF), unidentified cave amphipods and isopods (TM). Private. REFERENCES: Exley 1978 (cave description, map); Franz and Lee 1982 (Cc).

JAC-30. "TWO ENTRANCE CAVE" (unidentified cave in Florida Caverns State Park, possibly Millers Cave). APALACHICOLA FAUNA (Marianna Lowlands), cave-associated species. Public, Florida Caverns State Park, Florida Dept. Natural Resources. REFERENCES: Peck 1970 (terrestrial arthropods).

JAC-31. VETTER'S CAVE (Sec.27, T.5N, R.10W, Marianna Quad.). APALACHICOLA FAUNA (Marianna Lowlands), *Cambarus cryptodytes* (RF), other cave-associated species. Public, Florida Caverns State Park, Florida Dept. Natural Resources. REFERENCES: Franz 1982 (Cc); Franz et al. 1971 (snails); Hobbs et al. 1977 (Cc).

JAC-32. WADDELL'S MILL POND CAVE (Sec.33, T.6N, R.11W, Sills Quad.). APALACHICOLA FAUNA (Marianna Lowlands), *Cambarus cryptodytes* (USNM), other cave-associated species. Private. REFERENCES: Hobbs et al. 1977 (Cc).

JAC-33. WASHED-OUT CAVE (Sec.23, T.5N, R.11W, Cottondale East Quad.). APALACHICOLA FAUNA (Marianna Lowlands), *Cambarus cryptodytes* (Warren 1961), *Haideotriton wallacei* (Warren 1961). Private. REFERENCES: Franz 1982 (Cc); Hobbs et al. 1977 (Cc); Warren 1961 (Cc).

JAC-34. WELL, 2 mi south of Graceville (Sec.15, T.6N, R.13W, Graceville Quad.). APALACHICOLA FAUNA (Marianna Lowlands), *Cambarus cryptodytes*-type locality (USNM). Private. REMARKS: well filled (R. Williams, personal communication, Graceville, Florida, 1983). REFERENCES: Hobbs 1941 (Cc-type description), 1942*b* (Cc); Warren 1961 (Cc).

JEFFERSON COUNTY

JEF-1. WACISSA BIG BLUE SPRING (Sec.12, T.2S., R.3N, Wacissa Quad.). WOODVILLE FAUNA, *Procambarus horsti*-type locality (USNM), unidentified cave amphipods and isopods (TM). Public, state waters. REFERENCES: Hobbs and Means 1972 (Ph-type description); Hobbs et al. 1977 (Ph); Franz 1982 (Ph); Franz and Lee 1982 (Ph); Rosenau et al. 1977 (spring description).

LAFAYETTE COUNTY

LAF-1. ALLENS MILL POND SPRING (Sec.5, T.4S, R.11E, Dowling Park Quad). OCALA FAUNA (Upper Suwannee), *Procam-barus pallidus* (USNM), unidentified cave amphipods and isopods (TM). Public, Suwannee River Water Management District, recreation area. REFERENCES: Rosenau et al. 1977 (spring description).

LAF-2. ALLIGATOR RESCUE SPRING (Sec.25, T.4S, R.11E, Mayo Quad.). OCALA FAUNA (Upper Suwannee). *Procambarus pallidus* (TM). Public, state waters. REFERENES: map (TM).

LAF-3. BOBCAT SINK (Sec.21, T.4S, R.11E, Mayo Quad.). Lafayette Blue Spring System. OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (TM), unidentified cave amphipods (TM). Private.

LAF-4. GREEN SINK (Sec.21, T.4S, R.11E, Mayo Quad.). Lafayette Blue Spring System. OCALA FAUNA (Upper Suwannee), unidentified cave crayfishes, other cave-associated species (TM). Public, Blue Springs County Park, Lafayette County.

LAF-5. KASSERMAN SINK (Sec.1, T.6S, R.13E, Branford Quad.). Ruth Spring Cave System. OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (ATL). Private.

LAF-6. LAFAYETTE BLUE SPRING (Sec.21, T.4S, R.11E, Dowling Park Quad.). Lafayette Blue Spring Cave System. OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (ATL). Public, Blue Springs County Park, Lafayette County recreation area. REFERENCES: Rosenau et al. 1977 (spring description).

LAF-7. MAIN SINK (Sec.1, T.6S, R.13E, Branford Quad.). Ruth Spring Cave System. OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (ATL). Private.

LAF-8. OWENS SPRING (Sec.21, T.5S, R.13E, Mayo SE Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (TM). Private.

LAF-9. PERRY SPRING (Sec.35, T.4S, R.11E, Mayo Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (ATL), unidentified cave amphipods and isopods (TM). Private. REFERENCES: Rosenau et al. 1977 (spring description).

LAF-10. RUTH SPRING (Sec.1, T.6S, R.13E, Branford Quad.). Ruth Spring Cave System. OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM). Private. REFERENCES: Rosenau et al. 1977 (spring description).

LAF-11. TROY SPRING (Sec.34, T.5S, R.13E, O'Brien Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM). Private. REFERENCES: Franz and Lee 1982 (Pp); Rosenau et al. 1977 (spring description).

LAKE COUNTY

LAK-1. ALEXANDER SPRINGS (Sec.39, T.16S, R.27E, Alexander Spring Quad.). ST. JOHNS RIVER FAUNA (Lake George), *Procambarus delicatus*-type locality (USNM), unidentified cave isopods (TM). Public, Ocala National Forest, U.S. Forest Service, recreation area. REFERENCES: Franz and Lee 1982 (unidentified crayfish); Hobbs and Franz 1986 (Pd-type description); Relyea et al. 1976 (unidentified crayfish); Rosenau et al. 1977 (spring description).

LAK-2. EUSTIS (unidentified site). OCALA FAUNA (? area), *Procambarus lucifugus* subspecies? (USNM). REFERENCES: Hobbs 1940*a* (PlX?); Hobbs 1942*b* (PlX?).

LEON COUNTY

LEO-1. BIRD SINK SWALLET (Sec.17, T.1N, R.3E, Lloyd Quad.). WOODVILLE FAUNA, unidentified cave crayfishes (possibly *Procambarus horsti*) (TM). Private.

LEO-2. CAVE, 3 mi. north of Woodville (unidentified site, possibly Gopher Sink). WOODVILLE FAUNA, *Procambarus orcinus* (USNM).

LEO-3. CLAY SINK (unidentified site, possibly Gopher Sink). WOODVILLE FAUNA, *Procambarus orcinus* (USNM) (listed in Warren [1961] as *Procambarus pallidus*). REFERENCES: Warren 1961 (Po).

LEO-4. CULLEY'S CAVE (Sec.17, T.2S, R.1W, Lake Munson Quad.). WOODVILLE FAUNA, *Procambarus orcinus* (USNM). Leon Sinks Recreation Area, Apalachicola National Forest, U.S. Forest Service. REFERENCES: Hobbs and Means 1972 (Po), Hobbs III 1992 (photo of sink).

LEO-5. GOPHER SINK (Sec.16, T.2S, R.1W, Lake Munson Quad.). WOODVILLE FAUNA, *Procambarus orcinus*-type locality (USNM), unidentified cave amphipods, other cave-associated species. Private. REFERENCES: Franz 1982 (Po); Hobbs et al. 1977 (Po); Hobbs and Means 1972 (Po, type description); Holt 1973b (Cl as commensal of Po).

LEO-6. LITTLE DISMAL SINK (Sec.17, T.2S, R.1W, Lake Munsion Quad.). WOODVILLE FAUNA, *Crangonyx grandimanus* (JRH), *Procambarus orcinus* (USNM), unidentifed cave amphipods and isopods (TM). Public, Leon Sinks Recreation Area, Appalachicola National Forest, U.S. Forest Service.

LEO-7. MUNSON SLOUGH BLUE (sensitive, T.2S, R.1W, Lake Munson Quad.). WOODVILLE FAUNA, unidentified cave crayfishes (TM). Private. REFERENCES: TM (map).

LEO-8. NATURAL BRIDGE SPRING (Sec.29, T.2S, R.2E, Woodville Quad.). WOODVILLE FAUNA, unidentified cave amphipods and crayfishes (TM). Private. REFERENCES: Lane 1986 (description).

LEO-9. OSGOOD SINK (Sec.11, T.2S, R.1E, Woodville Quad.). WOODVILLE FAUNA, *Procambarus orcinus* (USNM). Private. REFERENCES: Franz 1982 (Ph); Hobbs et al. 1977 (Ph); Hobbs and Means 1972 (Ph).

LEO-10. SULLIVAN'S TUNNEL (or Hole-in-the-Ground) (Sec.13, T.2S, R.2W, Hilliardville Quad.). WOODVILLE FAUNA, *Crangonyx hobbsi* (JRH), *Procambarus orcinus* (USNM), unidentified cave isopods (TM). Public, Apalachicola National Forest, U.S. Forest Service. REFERENCES: Knab 1991 (cave length).

LEO-11. WELL, 4.5 mi east of Tallahassee (unidentified site.). WOODVILLE FAUNA, *Procambarus horsti* (USNM). Private. REFERENCES: Franz 1982 (Ph); Hobbs et al. 1977 (Ph); Hobbs and Means 1972 (Ph).

LEVY COUNTY

LEV-1. ARCHER CAVES (Sec.4, T.12S, R.18E, Bronson NE Quad.). OCALA FAUNA (Upper Suwannee), *Crangonyx grandimanus* (JRH), *Procambarus pallidus* (USNM), other cave-associated species. Private. REFERENCES: Franz and Lee 1982 (Pp).

LEV-2. BLUE GROTTO (or Williston Blue Sink) (Sec.2, T.13S, R.18E, Williston Quad.). OCALA FAUNA (Lower Suwannee), *Procambarus lucifugus* X *alachua* (USNM). Private, commercial recreation area.

LEV-3. DEVIL'S DEN (Sec.26, T.12S, R.18E, Williston Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM). Private. REFERENCES: Kurten 1966 (fossils); Martin 1974 (fossils); Pruitt 1991*b* (cave description, map); Rice 1957 (bats); Webb 1974 (fossils).

LEV-4. FOUR CAVE (Sec.28, T.12S, R.18E, Bronson NE Quad.). OCALA FAUNA (Upper Suwannee), cave-associated species. Private. REFERENCES: Pruitt 1990 (cave description, fish).

LEV-5. FRIEDMAN'S SINK (Sec.35, T.11S, R.13E., Manatee Springs Quad.). Manatee Springs Cave System. OCALA FAUNA (Lower Suwannee), *Crangonyx hobbsi* (JRH), *Procambarus lucifugus* X *alachua* (USNM). Public, Manatee Springs State Park, Florida Dept. Natural Resources. REFERENCES: Exley 1984 (description, map, photo).

LEV-6. GUNPOWDER CAVE (Sec.26, T.12S, R.14E, Williston Quad.). OCALA FAUNA (Upper Suwannee), *Troglocambarus maclanei* (USNM), unidentified cave crayfishes (*Procambarus lucifugus* complex?). Private.

LEV-7. HALF MOON CAVE (Sec.29, T.12S, R.18E, Williston Quad.). OCALA FAUNA, cave-associated species. Private. REFERENCES: Marshall 1947 (fish).

LEV-8. MANATEE SPRINGS (Sec.26, T.11S, R.13E, Manatee Springs Quad.). Manatee Springs Cave System. OCALA FAUNA (Lower Suwannee). *Crangonyx hobbsi* (JRH), *Procambarus lucifugus* X *alachua* (USNM), *Troglocambarus maclanei* (USNM). Public, Manatee Springs State Park, Florida Dept. Natural Resources. REFERENCES: Exley 1984 (exploration, map, photos); Franz 1982 (PlXa); Franz and Lee 1982 (PlXa); Knab 1991 (cave length); Rosenau et al. 1977 (spring description).

LEV-9. OCTOPUS CAVE (Sec.4, T.12S, R.18E, Bronson NE Quad.). OCALA FAUNA (Upper Suwannee), associated cave fauna. Private. REFERENCES: Pruitt 1991*a* (description, map, fauna).

LEV-10. PEANUT CAVE (Sec.24, T.13S, R.18E, Morristown Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus lucifugus alachua* (USNM). Private.

LEV-11. WELL, CHIEFLAND (unidentified site). OCALA FAUNA (Lower Suwannee), *Crangonyx grandimanus* (JRH), *Crangonyx hobbsi* (JRH). Private. REFERENCES: Franz 1982 (Ch).

MADISON COUNTY

MAD-1. BASELINE CAVE (Sec.33, T.1S, R.11E, Falmouth Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM), unidentified cave amphipods and isopods (TM). Private. REFERENCES: map (TM, BP).

MAD-2. MADISON BLUE SPRING (Sec.17, T.1N, R.11E, Ellaville Quad.). OCALA FAUNA (Upper Suwannee), *Crangonyx grandimanus* (JRH), *Crangonyx hobbsi* (JRH), *Procambarus pallidus* (ATL), other cave-associated species. Private. REFERENCES: Knab 1991 (cave length); Martin and Harris 1993 (mineralogy); Rosenau et al. 1977 (spring description).

MAD-3. M2 BLUE SPRING (Sec.32, T.2N, R.11E, Octahatchee Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM), other cave-associated species. Public, Suwannee River Water Management District. REFERENCES: Pruitt 1991*d*, 1992 (cave description, map).

MAD-4. SUWANNACOOCHEE SPRING (Sec.24, T.1S, R.11E., Ellaville Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM). Public, Suwannee River State Park, Florida Dept. Natural Resources. REFERENCES: Franz 1982 (Pp); Hobbs et al. 1977 (Pp); Rosenau et al. 1977 (spring description).

MAD-5. THUNDERHOLE SINK (Sec.10, T.1S, R.11E, Ellaville Quad.). OCALA FAUNA (Upper Suwannee), *Remasellus parvus* (USNM), *Procambarus pallidus* (USNM), unidentified cave amphipods (TM), other cave-associated species. Private. REFERENCES: Franz and Lee 1982 (Pp).

MARION COUNTY

MAR-1. BELLEVIEW CAVE (unidentified site, possibly Ocala Caverns). OCALA FAUNA (Marion), cave-associated species. REFERENCES: Peck 1970 (terrestrial arthropods).

MAR-2. BRIAR CAVE (Sec.35, T.15S, R.21E, Ocala West Quad.). OCALA FAUNA (Marion), *Procambarus lucifugus* X *alachua* (USNM). Private. REFERENCES: Johnson 1990; A. Krause 1990*b*; M. Krause 1990 (cave description, geology).

MAR-3. CHERT CAVE (Sec.10, T.16S, R.22E, Belleview Quad.). OCALA FAUNA (Marion), *Crangonyx hobbsi* (JRH), *Procambarus lucifugus* X *alachua* (USNM), *Troglocambarus maclanei* (USNM). Private.

MAR-4. COON CAVE (Sec.30, T.14S, R.22E, Anthony Quad.). OCALA FAUNA (Marion), *Procambarus lucifugus* X *alachua* (USNM). Private.

MAR-5. EICHELBERGER CAVE (Sec.2, T.17S, R.22E, Belleview Quad.). OCALA FAUNA (Marion), *Procambarus lucifugus* X *alachua* (USNM), *Procambarus pallidus*? (USNM). Private. REMARKS: Franz and Lee (1982) questioned the validity the *Procambarus pallidus* record. Unfortunately this cave was destroyed by limestone mining activities. REFERENCES: Auffenberg 1958, 1963 (fossils); Brodkorb 1956 (fossils); Franz 1982 (PlXa, Pp); Franz and Lee 1982 (PlXa, Pp); Hobbs et al. 1977 (PlXa, Pp).

MAR-6. FROG CRAWL CAVE (Sec. 15, T.14S, R.20E, Fairfield Quad.). OCALA FAUNA (Marion), unidentified cave crayfishes (FSS files). Private.

MAR-7. HELL HOLE (Sec.6, T.14S, R.21E, Reddick Quad.). OCALA FAUNA (Orange Lake), *Crangonyx hobbsi* (JRH), *Procambarus franzi* (USNM). Private. REFERENCES: Franz and Lee 1982 (Pf); Krause 1991 (cave description, map).

MAR-8. HOLLOWED GROUND CAVE. (Sec.36, T.15S, R.20E, Cotton Plant Quad.). OCALA FAUNA (Marion), *Caecidotea hobbsi*? (J. Lewis, personal communication). Private.

MAR-9. INDIAN CAVE (or Last Resort Cave) (Sec.36, T.15S, R.20E, Cotton Plant Quad.). OCALA FAUNA (Marion), *Crangonyx grandimanus*-type locality (NMC), *Crangonyx hobbsi* (USNM), *Procambarus lucifugus* X *alachua* (USNM), *Troglocambarus maclanei* (USNM). Private. REFERENCES: Bousfield 1963 (Cg, type description); Cooper 1965*a* (PlXa); Franz 1982 (Cg, PlXa, Tm); Hobbs 1942*b* (PlXa); Hobbs et al. 1977 (PlXa); Warren 1961 (PlXa).

MAR-10. JENNING'S CAVE (or Confederate Cave) (Sec.26, T.15S, R.19E, Romeo Quad.). OCALA FAUNA (Marion), cave-associated species. Private. REFERENCES: Peck 1970 (terrestrial arthropods).

MAR-11. MEFFORD CAVE (Sec.15, T.13S, R.21E, Reddick Quad.). OCALA FAUNA (Marion), cave-associated species. Private. REFERENCES: Auffenberg 1957*a*, 1958, 1963 (fossils); Gertsch 1984 (spiders); McNab 1974 (bats); Peck 1970 (terrestrial arthropods).

MAR-12. NICKELBERGER CAVE (Sec.2, T.17S, R.22E, Belleview Quad.). OCALA FAUNA (Marion), unidentified cave crayfishes, other cave-associated species (PS, BP, FSS files). Private.

MAR-13. OCALA CAVERNS (Sec.23, T.16S, R.22E, Belleview Quad.). OCALA FAUNA (Marion), *Procambarus lucifugus* X *alachua* (USNM). Private, previously commercialized. REFERENCES: Franz and Lee 1982 (PlXa).

MAR-14. ORANGE LAKE CAVE (Sec.34, T.12S, R.21E, McIntosh Quad.). OCALA FAUNA (Orange Lake), *Uncinocythere lucifuga* (AN), *Crangonyx hobbsi* (JRH), *Procambarus franzi*-type locality (USNM), *Troglocambarus maclanei* (USNM). Private. REFERENCES: Dickson and Franz 1980 (Pf, gill respiration); Davis and Rand 1982 (lime-encrusting algae); Franz 1982 (Ch, Pf, Tm); Franz and Lee 1982 (Tm); Hobbs and Lee 1976 (Pf, type description).

MAR-15. ORANGE LAKE QUARRY SOLUTION PITS (or Quarry Crevice Caves) (Sec.34, T.12S, R.21E, McIntosh Quad.). OCALA FAUNA (Orange Lake), *Procambarus franzi* (DSL). Private.

MAR-16. REDDING CATACOMBS (Sec.20, T.16S, R.22E, Shady Quad.). OCALA FAUNA (Marion), *Procambarus lucifugus* X *alachua* (RF). Private. REFERENCES: Franz and Lee 1982 (PlXa).

MAR-17. RAINBOW ACRES CAVE (unidentified site, possibly Jennings Cave). OCALA FAUNA (Marion), *Caecidotea hobbsi* (USNM).

MAR-18. ROOSEVELT CAVE (or Tillman's Cave) (Sec.32, T.15S, R.22E, Ocala East Quad.). OCALA FAUNA (Marion), *Caecidotea hobbsi* (USNM), *Crangonyx hobbsi* (Steeves 1964), *Procambarus lucifugus* X *alachua* (USNM). Private. REFERENCES: Franz 1982 (Ch, CaH, PlXa); Hobbs et al. 1977 (PlXa); Steeves 1964 (Cah); Warren 1961 (Cah, PlXa).

MAR-19. SILVER GLEN SPRINGS (Sec.25, T.14S, R.26E, Juniper Springs Quad.). ST. JOHNS RIVER FAUNA (Lake George), *Procambarus attiguus*-type locality (USNM), unidentified cave amphipods (TM), other cave-associated species. Public, Silver Glen Springs Recreation Area, U.S. Forest Service. REFERENCES: Hobbs and Franz 1992 (Pat); Rosenau et al. 1977 (spring description).

MAR-20. SILVER SPRINGS (Sec.6, T.15S, R.23E, Ocala East Quad.). ST. JOHNS RIVER FAUNA (Oklawaha), *Procambarus lucifugus* X *alachua* (USNM), unidentified cave amphipods and isopods (TM), other cave-associated species. Private, commercial recreation area. REFERENCES: Rosenau et al. 1977 (spring description).

MAR-21. STEEPLE CAVE (Sec.8, T.16S, R.22E, Shady Quad.). OCALA FAUNA (Marion), *Procambarus lucifugus* X *alachua* (Franz 1982). Private. REFERENCES: Franz 1982 (PlXa); Hobbs et al. 1977 (PlXa).

MAR-22. SUNDAY SINK (Sec.8, T.16S, R.22E, Shady Quad.). OCALA FAUNA (Marion), *Crangonyx hobbsi* (JRH), *Procambarus lucifugus* X *alachua* (USNM), *Troglocambarus maclanei* (USNM), other cave-associated species. Private. REFERENCES: Franz 1982 (PlXa, Tm); Franz and Lee 1982 (Tm); Hobbs et al. 1977 (PlXa, Tm).

MAR-23. TRADE WINDS FARM CAVE (unidentified site). OCALA FAUNA (Orange Lake), *Procambarus franzi* (USNM), *Troglocambarus maclanei* (USNM). Private.

MAR-24. VILLA HEIGHTS CAVE (unidentified site). OCALA FAUNA (Marion), cave-associated species. REMARKS: Hubbell (1936) noted that the cave was located 51.6 km (31 miles) south of Gainesville on State Highway 2. REFERENCES: Hubbell 1936 (crickets); Peck 1970 (terrestrial arthropods).

MAR-25. WALDO CAVE (Sec.35, T.15S, R.21E, Ocala West Quad.). OCALA FAUNA (Marion), *Procambarus lucifugus* X *alachua* (Hobbs 1942), other cave-associated species. Private. REFERENCES: Franz 1982 (PlXa); Hobbs 1942*b* (PlXa); Hobbs et al. 1977 (PlXa); Peck 1970 (terrestrial arthropods); Warren 1961 (PlXa).

MAR-26. WELL (2 mi NE of Anthony) (Sec.9?, T.14S, R.22E, Anthony Quad.). OCALA FAUNA (Orange Lake?), *Crangonyx grandimanus* (JRH). Private.

MAR-27. WOODS CAVE (Sec.13, T.16S, R.21E, Shady Quad.). OCALA FAUNA (Marion), unidentified cave crayfishes. Private. REFERENCES: FSS files.

MAR-28. ZUBER SINK (Sec.9, T.14S, R.20E, Fairfield Quad.). OCALA FAUNA (Orange Lake?), unidentified cave crayfishes (JB). Private.

ORANGE COUNTY

ORA-1. APOPKA BLUE HOLE (Sec.16, T.20S, R.28E, Sorrento Quad.). ST. JOHNS RIVER FAUNA (Wekiva), *Procambarus acherontis* (USNM), *Troglocambarus* sp. (USNM). Private, vulnerable to urban development. REFERENCES: Hobbs III 1992 (Tsp, photo).

ORA-2. ROCK SPRINGS Sec.15, T.20S, R.28E, Sorrento Quad.). ST. JOHNS RIVER FAUNA (Wekiva), *Caecidotea* sp.2 (USNM). Public, Rock Springs County Park. REFERENCES: Auffenberg 1963 (fossils); Rosenau et al. 1977 (spring description); Webb 1974 (fossils).

ORA-3. WEKIWA SPRINGS (Sec.36, T.20S, R.28E, Forest City Quad.). ST. JOHNS RIVER FAUNA (Wekiva), *Procambarus acherontis* (USNM). Public, Wekiva Springs State Park, Florida Dept. Natural Resources. REMARKS: Cooper (1965*a*) noted that "white crayfish had been seen around 1890." The USNM specimen was collected in moss on the outside of one of the cracks in the main spring in about 1.5 meters water depth by David A. Sukkert on 29 September 1990 (Rosi Mulholland, personal communication, Florida Park Service). REFERENCES: Cooper 1965*a* (description); Rosenau et al. 1977 (spring description).

ORA-4. WELL, LONG LAKE (Sec.36, T.21S, R.28E, Orlando West Quad.). ST. JOHNS RIVER FAUNA (Wekiva), *Procambarus acherontis* (Franz and Lee 1982). Public, county water well. REFERENCES: Franz 1982 (Pa); Franz and Lee 1982 (Pa).

PASCO COUNTY

PAS-1. ARCH SINK (or Arch-Way Sink) (Sec.2, T.24S, R.17E, Port Richey NE Quad.). OCALA FAUNA (Gulf Coastal Lowlands), *Procambarus leitheuseri* (USNM). Private. REFERENCES: Franz and Hobbs 1983 (Ple).

PAS-2. BLACK HOLE (Sec.14, T.24S, R.16E, Aripeka Quad.). OCALA FAUNA (Gulf Coastal Lowlands), *Procambarus leitheuseri*

(USNM), other cave-associated species. Private. REFERENCES: Franz and Hobbs 1983 (Ple).

PAS-3. NEXUS SINK (Sec.3, T.25S, R.16E, Port Richey Quad.). OCALA FAUNA (Gulf Coastal Lowlands), *Crangonyx grandimanus* (JRH), *Crangonyx hobbsi* (JRH), *Procambarus leitheuseri* (USNM). Private. REFERENCES: Franz and Hobbs 1983 (Ple).

PAS-4. WELL, LACOOCHEE (unidentified site). OCALA FAUNA (Gulf Coastal Lowlands), *Crangonyx hobbsi* (JRH).

PINELLAS COUNTY

PIN-1. KNIGHT'S SINK (Sec.19, T.27S, R.16E, Elfers Quad.) OCALA FAUNA (Gulf Coastal Lowlands), unidentified cave crayfish (P. Heinerth, personal communication, 1984). Public, Anderson County Park, next to Tarpon Sink on west side of Lake Tarpon. REFERENCES: Wetterhall 1965 (hydrology).

PUTNAM COUNTY

PUT-1. DEVIL'S SINK (Sec.13, T.10S, R.23E, Interlachen Quad.). ST.JOHNS RIVER FAUNA (Oklawaha), *Uncinocythere ambophora* (Walton and Hobbs 1959), *Procambarus morrisi*-type locality (USNM), unidentified amphipods. Private, vulnerable to groundwater pollution from unauthorized dumping. REFERENCES: Hobbs and Franz 1990 (Pm, type description, Ua as commensal of Pm).

SEMINOLE COUNTY

SEM-1. PALM SPRING (Sec.2, T.21S, R.29E, Forrest City Quad.). ST. JOHNS RIVER FAUNA (Wekiva), *Uncinocythere ambophora*-type locality (USNM), *Procambarus acherontis* (USNM), other cave-associated species. Private, urban development. REMARKS: The Palm Springs basin (surface drainage area, 1.77 square miles) consists of Lake Marion, Eleven Hole Pond, and several small unconnected sinks (Anderson and Hughes 1975). The drainage area includes a golf course which is the probable location of the type locality of *Procambarus acherontis*. REFERENCES: Anderson and Hughes 1975 (hydrology); Cooper 1965*a* (spring description, Pa collection information); Franz 1982 (Pa); Hobbs 1940*a* (Pa redescription); Hobbs 1942*b* (Pa account); Hobbs et al. 1977 (Pa); Rosenau et al. 1977 (spring description); Walton and Hobbs 1959 (Ua, type locality); Warren 1961 (Pa).

SEM-2. WELL, ALTAMONTE SPRINGS (Sec.13, T.21S, R.29E, Casselberry Quad.). ST. JOHN RIVER FAUNA (Wekiva), *Procambarus acherontis* (RF). Private, urban. REFERENCES: Franz 1982 (Pa); Franz and Lee 1982 (Pa).

SEM-3. WELL, LAKE BRANTLEY (Sec.3, T.21S, R.29E, Forrest City Quad.). ST. JOHNS RIVER FAUNA (Wekiva), *Procambarus acherontis*-type locality (ZIAS). Private, urban. REMARKS: The *acherontis* specimens described by Einar Lonnberg were taken from a hand dug well on the farm of A. E. Sjoblom near Lake Brantley in 1893 (Lonnberg 1894). From land records in the Orange County Court House, we found that A. E. Sjoblom paid taxes on the following tracts in 1894. The land descriptions as found in the tax records are as follows: Plot 1. "Begins 573 feet north, 712 feet east of the SW corner of NW 1/4 (of Section 3), runs east 300 feet, north578 feet, west 300 feet, and south 578 feet." Plot 2. "Begins 4.5 chains west of SE corner of SW 1/4, of the NW 1/4, north 4.13 chains, west 1.21 chains, south 4.13 chains." (chain= 66 feet). This site is now located on a portion of the Sabal Point Golf Course. The owners and grounds people at the golf course knew of no open wells on the property, and we presume the well has been filled. RFERENCES: Faxon 1898; Franz 1982 (Pa); Hobbs 1940*a* (Pa, description), 1942*b* (Pa); Lonnberg 1894, 1895 (Pa, type description); Warren 1961 (Pa).

SUWANNEE COUNTY

SUW-1. ANDERSON SPRING (Sec.35, T.1S, R.11E, Falmouth Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave crayfishes and amphipods (TM). Public, Florida state waters.

SUW-2. AZURE BLUE SINK (or Collins Farm Sink) (Sec.9, T.6S, R.15E, Hildreth Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus erythrops* (USNM), *Troglocambarus maclanei* (USNM), unidentified cave amphipods (TM), other cave-associated species. Private. REFERENCES: Franz and Lee 1982 (Pe).

SUW-3. BLUE SINK (Sec.10, T.2S, R.15E, White Springs West Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave amphipods (TM). Private.

SUW-4. BONNETT SPRING (Sec.20, T.4S, R.12E, Mayo Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (ATL), unidentified cave amphipods (TM). Private. REFERENCES: Rosenau et al. 1977 (spring description).

SUW-5. BUFO SINK (Sec.24, T.6S, R.14E, Branford Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus erythrops* (B. Sutton). Private. REMARKS: One of the sites mentioned by Releya and Sutton in the description of *Procambarus erythrops* (B. Sutton, personal communication, Gainesville, Florida). REFERENCES: Franz 1982 (Pe); Hobbs et al. 1977 (Pe); Relyea and Sutton 1975 (Pe).

SUW-6. CHALLENGE SINK (Sec.20, T.4S, R.12E, Dowling Park Quad.). OCALA FAUNA (Upper Suwannee), *Crangonyx hobbsi* (JRH), *Procambarus pallidus* (ATL). Public, Peacock Springs State Park, Florida Dept. Natural Resources.

SUW-7. CHARLES SPRING (Sec.4, T.4S, R.11E, Dowling Park Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus*, unidentified cave amphipods (TM). Public, Suwannee County park.

SUW-8. CISTEEN SINK (Sec.21, T.4S, R.11E, Dowling Park Quad.). OCALA FAUNA (Upper Suwannee), *Crangonyx grandimanus* (JRH), *Crangonyx hobbsi* (JRH), *Procambarus pallidus* (USNM). Public, Peacock Springs State Park, Florida Dept. Natural Resources.

SUW-9. COW SPRING CAVE (Sec. 28, T.4S, R.12E, Dowling Park Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM), unidentified cave amphipods (TM). Private.

SUW-10. CRAZY HORSE SINK (Sec.21, T.4S, R.12E, Mayo Quad.). Mirkwood Sink Cave System. OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM), unidentified cave amphipods (TM). Private.

SUW-11. DEBRIS CONE SPRING (Sec.9, T.4S, R.11E, Dowling Park Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave crayfishes (TM). Private. REFERENCES: map (TM, J. Brown).

SUW-12. DEVIL'S HEAD AND HORNS (Sec.12, T.5S, R.13E, O'Brien SE Quad.). OCALA FAUNA (Upper Suwannee), cave-associated species. Private. REMARKS: Reportedly filled in (Julie Hovis, personal communication, Florida Game and Fresh Water Fish Commission, 1991). REFERENCES: Rice 1957 (bats).

SUW-13. DOUBLE SINK (Sec.16, T.5S, R.14E, O'Brien Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (ATL). Private.

SUW-14. EDWARDS SPRING (Sec.24, T.1S, R.11E, Ellaville Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM), unidentified amphipods and isopods (TM). Private. REFERENCES: S. Exley (map)

SUW-15. FALMOUTH SPRING/SIPHON (or Cathedral Cave) (Sec.32, T.1S, R.12E, Falmouth Quad.). Falmouth Cave System. OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (ATL), unidentified amphipods (TM). Private. REFERENCES: Rosenau et al. 1977 (spring description), S. Exley (map).

SUW-16. GHOUL SINK (Sec.32, T.1S, R.12E, Falmouth Quad.). Falmouth Spring Cave System. OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM). Private.

SUW-17. HILDRETH CAVE (Sec.16, T.6S, R.15E, Hildreth Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus erythrops* (USNM). Private. REFERENCES: Relyea and Sutton 1975 (Pe).

SUW-18. IRVINE SLOUGH SPRING (Lauraville Spring) (Sec.24, T.4S, R.11E, Mayo Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (ATL), unidentified cave amphipods and isopods. Private. REFERENCES: Rosenau et al. 1977 (spring description), TM (map).

SUW-19. LINEATER SPRING (Sec.7, T.1S, R.12E, Ellaville Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (TM), unidentified cave amphipods (TM). Private.

SUW-20. LITTLE RIVER SPRING (Sec.1, T.6S, R.13E, Branford Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM), unidentified cave amphipods and isopods (TM), other cave-associated species. Public, Little River Springs County Park. REFERENCES: Franz and Lee 1982 (Pp); Rosenau et al. 1977 (spring description); Streever 1993 (invertebrates).

SUW-21. MIRKWOOD SINK (Sec.21, T.4S, R.11E, Mayo Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM). Private.

SUW-22. MULKY ROAD SINK (Sec.29, T.6S, R.15E, Hildreth Quad.). OCALA FAUNA (Upper Suwannee), cave-associated species (RF). Private.

SUW-23. O'HARA CAVE (Sec.24, T.1S, R.11E, Ellaville Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave crayfishes (PS, 1977). Private.

SUW-24. OLSEN SINK (Sec.20, T.4S, R.11E, Dowling Park Quad.). Peacock Slough Cave System. OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (JB). Public, Peacock Springs State Park, Florida Dept. Natural Resources.

SUW-25. ORANGE GROVE SINK (Sec.20, T.4S, R.12E, Dowling Park Quad.). Peacock Slough Cave System. OCALA FAUNA (Upper Suwannee), *Crangonyx grandimanus* (JRH), *Crangonyx hobbsi* (JRH), *Procambarus pallidus* (USNM), other cave-associated species. Public, Peacock Springs State Park, Florida Dept. Natural Resources. REFERENCES: DeLoach and Arteaga 1972 (cave description); Rosenau et al. 1977 (spring description).

SUW-26. OSTEEN SINK (unidentified site). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM).

SUW-27. PEACOCK SLOUGH (unnamed cave in Peacock Slough Cave system) (Sec.20, T.4S, R.12E, Dowling Park Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM). Public, Peacock Springs State Park, Florida Dept. Natural Resources. REFERENCES: Hobbs 1971 (Pp); Hobbs et al. 1977 (Pp); Martin and Harris 1993 (mineralogy).

SUW-28. PEACOCK SPRING CAVE (Sec.20, T.4S, R.12E, Dowling Park Quad.). Peacock Slough Cave System. OCALA FAUNA (Upper Suwannee), *Remasellus parvus* (USNM), *Crangonyx grandimanus* (JRH), *Crangonyx hobbsi* (JRH), *Procambarus pallidus* (USNM), other cave-associated species. Public, Peacock Springs State Park, Florida Dept. Natural Resources. REFERENCES: Bowman and Sket 1985 (Rp); Exley and DeLoach 1981 (cave description); Exley and Fisk 1978 (cave description); Franz 1982 (Pp); Fisk and Exley 1977 (description); Rosenau et al. 1977 (spring description), Streever 1992*b* (crayfish kill).

SUW-29. PEACOCK SINK 3 (Sec.20, T.4S, R.12E, Dowling Park Quad.). Peacock Slough Cave System. OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (JB). Public, Peacock Springs State Park, Florida Dept. Natural Resources.

SUW-30. POT HOLE SINK (Sec.20, T.4S, R.12E, Mayo Quad.). Peacock Slough Cave System. OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (JB). Public, Peacock Springs State Park, Florida Dept. Natural Resources. REFERENCES: Rosenau et al. 1977 (spring description).

SUW-31. QUARRY SINK (Sec.23, T.6S, R.14E, Branford Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus erythrops* (Franz 1982). Private. REMARKS: According to B. Sutton (personal communication), this was one of the unidentified localities where Relyea and Sutton found crayfishes during their surveys in preparation for the description of *Procambarus erythrops*. REFERENCES: Franz 1982 (Pe); Relyea and Sutton 1975 (Pe).

SUW-32. REGISTER SINK (Sec.17, T.5S, R.14E, O'Brien Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (ATL). Private.

SUW-33. SANDBAG SPRING (Sec. 34, T.4S, R.12E, Mayo SE Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (TM), unidentified cave amphipods (TM). Private.

SUW-34. SIM'S SINK (also Simm's Sink) (Sec.24, T.6S, R.14E, Branford Quad.). OCALA FAUNA (Upper Suwannee), *Crangonyx hobbsi* (JRH), *Procambarus erythrops*-type locality (USNM), *Troglocambarus maclanei* (USNM), unidentified cave isopods (TM). Private, The Nature Conservancy, cave crayfish preserve. REFERENCES: Franz 1982 (Ch, Pe, Tm); Franz and Lee 1982 (Pe); Hobbs et al. 1977 (Pe, Tm); Holt 1973*b* (Cl as commensal on Pe); Mellon 1977 (Pe, ocular response); Mellon and Lnenicka 1980 (Pe, ocular response); Relyea and Sutton 1975 (Pe, type description).

SUW-35. SMITH SINK (Sec. 20, T.5S, T.14E, O'Brien Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (ATL). Private.

SUW-36. STICK SINK (Sec. 34, T.4S, R.14E, O'Brien Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (ATL). Private.

SUW-37. SUWANNEE BLUE SPRING (Sec.1, T.4S, R.11E, Dowling Park Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave amphipods (TM). Private.

SUW-38. TELFORD SPRING (or Tilford Spring) (Sec.25, T.4S, R.11E, Mayo Quad.). Luraville-Telford Spring System. OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (USNM). Private. REFERENCES: Knab 1991 (cave length); Martin and Harris 1993 (mineralogy); Rosenau et al. 1977 (spring description), Streever et al. 1993 (sediment deposition).

SUW-39. TEN MILE HOLLOW CAVE (Sec.35, T.4S, R.12E, Mayo SE Quad.). OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (TM). Private.

SUW-40. WATER HOLE 3 SINK (Sec.20, T.4S, R.12E, Mayo Quad.). Peacock Slough Cave System. OCALA FAUNA (Upper Suwannee), *Procambarus pallidus* (JB). Public, Peacock Springs State Park, Florida Dept. Natural Resources.

SUW-41. WATERING HOLE SPRING (Sec.9, T.4S, R.11E, Dowling Park Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave crayfishes and amphipods (TM). Private.

SUW-42. WINGATE WELL (Sec.23, T.5S, R.13E, Mayo SE Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave cray-fishes, amphipods, and isopods (TM). Private.

SUW-43. YUCK SPRING (Sec. 22, T.4S, R.11E, Dowling Park Quad.). OCALA FAUNA (Upper Suwannee), unidentified cave cray-fishes, amphipods, and isopods (TM). Private.

WAKULLA COUNTY

WAK-1. EMERALD SINK (Sec.20, T.2S, R.1W, Lake Munson Quad.). Emerald Sink Cave System. WOODVILLE FAUNA, *Crangonyx hobbsi* (JRH), *Crangonyx grandimanus* (JRH), *Procambarus orcinus* (USNM). Public, Apalachicola National Forest, U.S. Forest Service. REFERENCES: Exley and Goodman 1981 (cave description, map).

WAK-2. INDIAN SPRINGS (Sec.3, T.3S, R.1W, Crawfordville Quad.). WOODVILLE FAUNA, *Procambarus orcinus* (USNM). Private. REFERENCES: Rosenau et al. 1977 (spring description); Exley and Goodman 1981 (cave description).

WAK-3. MCBRIDE SLOUGH SPRING (Sec.7, T.3S,. R.1E, Crawfordville Quad.). Wakulla Springs Cave System. WOODVILLE FAUNA, *Crangonyx grandimanus* (JRH), *Crangonyx hobbsi* (JRH),

Procambarus orcinus (USNM), unidentified cave amphipods and isopods (Morris 1989). Private. REFERENCES: Morris 1989 (Po).

WAK-4. RIVER SINKS (Sec.28, T.2S, R.1W, Lake Munson Quad.). Emerald Sink Cave System. WOODVILLE FAUNA, *Crangonyx* sp. (JRH), *Crangonyx hobbsi* (JRH), *Procambarus orcinus* (Caine 1978). Private. REFERENCES: Caine 1978 (Po, ecology); Rosenau et al. 1977 (spring description); Exley and Goodman 1981 (map).

WAK-5. SALLY WARD SPRING (or Numero Uno Spring) (Sec.11, T.3S, R.1W, Crawfordville Quad.). Wakulla Springs Cave System. WOODVILLE FAUNA, *Crangonyx* sp. (JRH), *Crangonyx hobbsi* (JRH), *Procambarus orcinus* (Morris 1989). Public, Wakulla Springs State Park, Florida Dept. Natural Resources. REFERENCES: Morris 1989 (Po, photo); Wilson and Sparks 1992 (hydrology).

WAK-6. SHEPARD BLUE SPRING (Land Grant Sec. 99, Hartsfield Survey, Spring Creek Quad.). WOODVILLE FAUNA, *Crangonyx grandimanus* (JRH), *Crangonyx hobbsi* (JRH), *Procambarus horsti* (USNM). Public, state waters. REFERENCES: Rosenau et al. 1977 (spring description).

WAK-7. SPLIT SINK (Sec.20, T.2S, R.1W, Lake Munson Quad.). Emerald Sink Cave System. WOODVILLE FAUNA, *Remasellus parvus* (USNM). Public, Apalachicola National Forest, U.S. Forest Service. REFERENCES: Exley and DeLoach 1981 (cave description, map); Bowman and Sket 1985 (Rp, generic description); Exley and Goodman (map).

WAK-8. WAKULLA SPRINGS (Sec.11, T.3S, R.1W, Crawfordville Quad.). Wakulla Springs Cave System. WOODVILLE FAUNA, *Procambarus orcinus* (USNM), *Procambarus horsti*(?) (Morris 1989), unidentified cave amphipods and isopods (Morris 1989). Public, Wakulla Springs State Park, Florida Dept. Natural Resources. REFERENCES: DeLoach et al. 1989 (description); Franz 1982 (Po); Hobbs et al. 1977 (Po); Hobbs and Means 1972 (Po); Lane 1986 (cave description); Mohr 1964 (fossils); Morris 1989 (Po); Olsen 1958; Rosenau et al. 1977 (spring description); Rupert 1991 (geology); Rupert and Wilson 1989 (geology and hydrology); Skiles 1989 (cave description); Webb 1974 (fossils).

WASHINGTON COUNTY

WAS-1. ECONFINA BLUE SPRING CAVE (Sec.27, T.1N, R.13W, Bennett Quad). ECONFINA CREEK FAUNA, *Caecidotea* sp.1 (JL), *Dasyscias franzi*-type locality (UF), other cave-associated species. Private. REFERENCES: Rosenau et al. 1977 (spring description); Thompson and Hershler 1991 (Df, type description).

WAS-2. FALLING WATERS TRAIL CAVE (Sec.27, T.4N, R.13W, Wausau Quad.). APALACHICOLA FAUNA (?), cave-associated species. Public, Falling Waters State Park, Florida Dept. Natural Resources. REFERNCES: Franz et al. 1971 (snails); Lane 1986 (map).

DECATUR COUNTY, GEORGIA

DEC-1. CLIMAX CAVE (3 mi N of Climax). APALACHICOLA FAUNA (SW Georgia), *Uncinocythere warreni*-type locality (USNM), *Cambarus cryptodytes* (USNM), *Haideotriton wallacei* (UF). Private. REFERENCES: Beck and Arden 1984 (geology, cave map); Hobbs 1981 (Cc account); Hobbs and Walton 1968 (Uw, type description); Hobbs et al. 1977 (Cc); Maddox 1992 (radon concentrations); Warren 1961 (Cc, Hw).

DOUGHERTY COUNTY, GEORGIA

DOU-1. WELL, ALBANY (unidentified site). APALACHICOLA FAUNA (SW Georgia), *Haideotriton wallacei*-type locality (MCZ). Private. REFERENCES: Carr 1939 (Hw, type description).